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THE AMERICAN
JOURNAL OF PHARMACY

VOL. 97. NOVEMBER, 1925. NO. 11.

EDITORIAL

ONE HUNDRED YEARS OLD.

From 1825 to 1925 was only a wisp of time—as truly fleeting as any century that had gone before. Yet in the history of civilization—in the forward march of man—in the calendar of achievements—it was a long, long century.

More water passed under the bridge of progress during this period than ever in a like period in the history of the world.

Man and his voice ride the ether—under and over the ocean waves he goes with equal ease—he has annihilated distance—shattered the atom—harnessed the electron—he claims now to be close to the borderline of the shadow spirit world—and has even the temerity to seek a solution of the riddle of life itself.

All of this in a century.

And who can stand on the pinnacle of this century's accomplishments, looking hence another similar span of time, without trembling at the thought of what is yet to come in the way of great events—of great discoveries—of great disappointments?

To have survived the vicissitudes, the eccentricities, the whirling progress of such a century is a mark of real worth. Such is the record of this ancient Journal. Founded in 1825, by members of the Philadelphia College of Pharmacy, maintained during the long century—without let-up—by the altruistic spirit of that great institution, THE AMERICAN JOURNAL OF PHARMACY has now come upon its Hundredth Birthday Anniversary.

It is proposed to have the December issue of this periodical dedicated to a celebration of its century of scientific service as "A Record of the Progress of Pharmacy and the Allied Sciences."

Truly, a centenarian, so virile, so useful, and so eminently respectable as this Journal, is deserving of a birthday celebration.

IVOR GRIFFITH.

ANOTHER WORLD WAS NEEDED.

Startling assertion. Do we need to resume the dreadful stories of submarines, airplanes, poison gases, trench misery, and all the other horrors that were so fearfully prominent for a few years? Shall there again drop

"the ghastly dew
From the nations' airy navies, grappling in the central blue"?

No, but there is need for a general war of extermination against man's greatest enemies, the insects. Some insect species are beneficial, some seem without noticeable value, but not appreciably harmful, but there is a large class carrying disease or producing vast destruction of food and other materials.

The number of insect species is immense. Many hundreds of thousands have been described and named. Most species are very prolific and the restraint of them is difficult. Of all classes, the blood-sucking species are the most dangerous, for they are direct carriers of some of the most serious diseases. The part taken by the mosquito in carrying malaria and yellow fever is well known; also the work of the tsetse fly in conveying sleeping sickness. It was asserted with confidence that the epidemic of typhus in Serbia during the late war was almost entirely due to lice, and it is also regarded as established that plague is distributed by the rat-flea.

Apart from these dangers is the enormous destruction that insects cause by depredations on plants. Our food plants have by extreme selection and cultivation for specific results, suffered some diminution of their natural resistance to disease. Just as the highly specialized races of men suffer a greater variety of diseases than the savage tribes who are closer to natural conditions, so the plants of our fields and gardens succomb to influences that would be of comparatively little effect on the wilder forms. Some years ago, two scientists connected with Cornell University, studied the insect enemies of the common cattail reed (*Typha sp.*). They found that it was attacked regularly by more than a score of different insects. Some attacked the root, others the stem, others the leaf and others again the flower and fruit. Unprotected by spraying or other conventional methods of insect control, the plant grows abundant in its proper soil from year to year. This is presumably because it has long since adjusted itself to its environment, and man has not "selected" it for his purpose.

An important influence favoring insect development and spread has been the destruction of bird-life. Unrelenting war has been made upon birds, partly because of their food value, partly for securing ornamentation for women's attire, but largely through mere ruthlessness; the desire to "shoot something on the wing." In normal conditions birds will control insect life very well. When the eastern portions of America were first settled, wild life of all kinds was abundant. The woods were full of game and the streams of fish. The passenger pigeon was so abundant that it could be secured with scarcely any effort; furred animals could be obtained easily. Almost any stream would yield in an hour enough fish for a large family. These conditions are mostly gone. Apparently no specimen of the passenger pigeon remains alive. Efforts have been made to secure bird refuges and in other ways to preserve the useful wild plants and animals, but such efforts have but little support among people at large, and there are rumors that in the next Congress an organized assault will come out of the West against the national conservation movement.

A book recently published under the peculiar title of "Bats, Mosquitoes and Dollars," written by Dr. Charles A. R. Campbell, argues strongly in favor of protecting and breeding the common bat, which is said to be an especially active enemy of the mosquito and presumably of other night-flying insects. Dr. Campbell argues well and with full knowledge, but it is likely that the dislike of bats will prevent widespread adoption of his plan. He also sets forth a theory that the bedbug is the principal (indeed, he seems to argue, the only) disseminator of smallpox. That the bedbug, like all bloodsucking animals, may carry contagion, seems not to admit of doubt, but experience in our large American cities indicates other lines of transmission.

The condition is such that the energies of all civilized nations should be enlisted in a ruthless, well-equipped crusade against all insects that may carry disease or do harm to animals and plants. Incidentally such vermin as rats and mice should also be attacked.

HENRY LEFFMANN.

ORIGINAL ARTICLES

CONTROL OF GROWTH IN PLANTS AND ANIMALS.*

By Arno Viehoever, Ph. C., F. C., Ph. D.
Professor of Biology and Pharmacognosy.

Growth—the glorious theme in the symphony of life! If all the instruments of the living organism, man, animal or plant, play in tune we have harmony of healthy development. But let one of the instruments play out of tune, and we have as a result discord, disorganization, disease, monstrosity, failure. How is this so?

All organisms consist of minute units, cells; some are unicellular, others many celled. These cells, the morphological as well as physiological elements of structure, have within their membrane the life sustaining, butter-like mass "proto-plasm." In it we find imbedded, somewhat as a core, the nucleus, the seat of reproduction and hereditary transmission of characters, and one or more granular bodies (nucleoli). The cells live through a continued exchange of substances within and without. Form-development, energy transformation and metabolism, the upbuilding and breaking down of the proto-plasm, are the common manifestations of life.

I.

Nature of Growth.

Growth is the outstanding consequence of all development, of the single cell, as well as of the whole tissue. In the growing cell we have a continued sequence of different conditions of metabolism in slow transition, each following condition resulting, necessarily, from the foregoing. Through gradual assimilation of new matter into the living organisms the cell is expanded, divided, the tissue increased in volume and diversified in form and function. This process does not take place with uniform velocity throughout life. Periods of slow growth are followed by periods of relatively rapid growth, which in turn are succeeded by a period of slow growth. This growth in "spurts" is well known in children, animals and plants. Generally speaking, youth, maturity and old age constitute the three stages of

*One of a Series of Popular Lectures given at the Philadelphia College of Pharmacy and Science, 1924-1925 Season.

growth. In youth we find growth accelerated, in the mature period progressing steadily and in old age, retarded.

In contrast to dead systems we find in living organisms highly complicated protein molecules. Their metabolism is likely predominately responsible for the living process.

Form and Function.—Living organisms or certain of their parts have often been compared with machines. The recognition, centuries ago, of such facts as the heart-functioning like a force-pump, or the limbs being moved by a system of levers, has stimulated many fruitful investigations. While the comparison of the powers of *life* with the workings of machines is still greatly inadequate, we realize

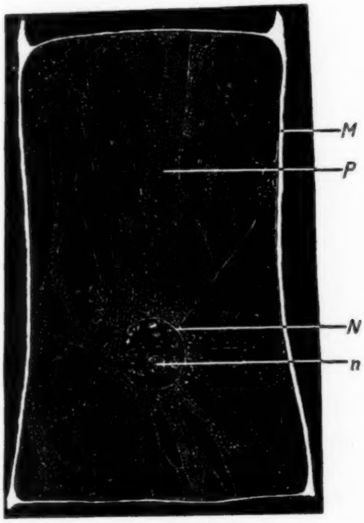

FIGURE 1.

Plant cell. (Hair of Field Pumpkin—Cucurbita pepo.) M.—Membrane. P.—Protoplasm. N.—Nucleus. n.—nucleolus. (After Heidenhain.)

clearly, today, the interdependent character of function and structure. Function produces structure, while structure modifies function. The more differentiated the structure, the greater the possibilities of function.

We find also, a remarkable adaptability of organisms, in form and function, to conditions as they occur in nature or as they may be

brought about experimentally. Some animals, for instance, are eminently fitted for their life in water, others for their existence on land or in air. While a subject of experimental growth, it may be mentioned here that tadpoles, if prevented from reaching dry land at a certain stage of development, never complete their life cycle. They retain structure and function suitable for life in water and thus never reach the frog-stage. In our own experiments the animal grown and kept, practically from the beginning, in a well-filled aquarium for about four months never threw off its tail and never developed legs. We shall mention further examples of experimental growth later on.

II.

Essentials of Growth.

Nutrients.—Of the eighty-seven known elements, thirty-four have been found to enter into living proto-plasm. Thirteen are invariably found and seem to be on the whole essential to life. These are Hydrogen (H), Carbon (C), Oxygen (O), Nitrogen (N), Phosphorus (P), Sulphur (S), Potassium (K), Magnesium (Mg), Calcium (Ca), Iron (Fe), Sodium (Na), Chlorine (Cl) and Silicon (Si). The percentage of elements found in an organism stands in no relation to their abundance in nature, in soil, water or atmosphere. The following elements, arranged in the descending order of their percentage occurrence, have recently been reported for man, O. C. H. N. Ca. P. K. S. Cl. Na. Mg. I. F. Fe. Br. and Al.; for gymnosperms (pines and other coniferous trees) C. O. H. Al. Si. S. F. N. Ca. K. P. Mg. Cl. Na. F. Mn.

Serious disturbances in growth are soon observed when only one of the essential elements is wanting.

Of course we find structural modifications which either reduce the need for constant supplies of water, or which, as in the case of certain desert plants, reduce the amount of water given off through transpiration. The author found even hygroscopic substances (saponins) in the cellsap of yuccas and agaves, growing in arid regions. An example for crippling life through systematic starvation is presented in the Japanese pine-tree, which is skillfully kept from natural death. The resurrection plant (Selaginella), and in the animal kingdom the bear-animalcules, "Macrobiotus Hufelandi," are forms of life which may exist in air-dry conditions, though this form of life may be designated merely as latent. The need for lime (calcium)

in the formation of cell structure in plants and bones in animals can be readily demonstrated. That the lack of lime especially in early childhood is mainly responsible for the later decay of teeth appears proven by the experimental work of McCollum, of Johns Hopkins University. The lack of other bio-elements causes other changes of more or less serious character; without phosphorus no nucleus, without nitrogen, hydrogen and carbon, no proteins could be formed; without magnesium no chlorophyll could exist; without potassium the proto-plasm would be incomplete, and so forth. That the presence of certain amino acids in the proteins is also essential and that some, like

FIGURE 2.
Very Old Japanese Pine. Dwarfed through starvation and malnutrition. About one yard high. (After Molisch.)

wheat proteins, through lack of lysin, or others through lack of trytophan, etc., are deficient for food or feed, has been conclusively shown by experiments of McCollum, of Mendel and Osborne, C. O. Johns and others.

Vitamins.—To these bio-elements, essential to satisfactory nutrition, must be added a group of substances to which the name vitamin has been applied by their discoverer, C. Funk. Their chemcal nature is unknown,* with exception of one, "Bios," D II, a crystal-

*Jakahashi just claims to have isolated vitamin "A" as a yellowish red oil, resembling in composition and behaviour cholesterin and called therefore "biosterin."

line substance with pyrrole ring; the source of the various vitamins and the diseases prevented by their presence are, however, well established now.

VITAMINS.

Nature.	*Sources.*	*Presence Presents:*
Vitamin A	(a) Butter, fat, cod liver oil, (b) Green leaves (not fat soluble form)	Xerophthalmia (atrophy of inner eyelid)
Vitamin B	grains yeast	Polyneuritis in infants, Beri-Beri.
Vitamin C	fresh fruits vegetables	Scurvy
Vitamin D I	Cod liver oil	Rickets, "English disease"
Vitamin D II	grains yeast	lack of growth of mammals, Beri-Beri.

That vitamins, found to be necessary in animal nutrition, are also essential in plant metabolism may be assumed from their abundant occurrence in lower and higher plants. Even in bacteria vitamins have recently been found.

Endocrine Products.—In addition to bio-elements and vitamines, the animal body needs for its satisfactory development and functioning a number of secretory and glandular products. An illustrated sketch indicates their location and the tabulation refers to location and function of the glands.

ENDOCRINE GLANDS.

Gland.	*Location.*	*Function.*
Pineal	In the brain	controls puberty, affects sex development.
Pituitary	Front base of brain	controls growth of skeleton and affects brain and sex tone.
Thyroid and Parathyroid	Both sides of larynx	affects brain and sex tone.
Thymus	Rests on the trachea	controls sugar metabolism of the body.
Adrenals	Top of kidneys	glands of combat; affect growth of brain and sex glands, also add energy for emergency.

Of these products only adrenalin has been satisfactorily studied and even synthesized. Other substances, as thyroxin, have been isolated as crystals, while insulin is thus far only known as an amorphous substance. The fact that some constituents present in glandular products have been observed by Slothower, and later by the writer, to occur in a crystalline condition, should facilitate the problem of isolation and study.

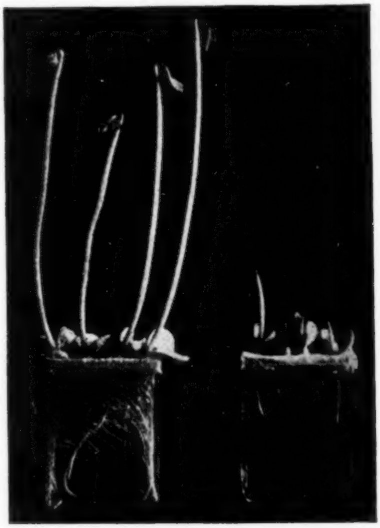

FIGURE 3.

Need for Lime (Calcium) in Plants. Embryo of Spanish Bean. (Phaseolus multiflorus.) Nutrient solution with calcium. Without calcium. (After Molisch.)

III.

Unicellular Organism.

Normal Growth.—The organisms consisting of but one cell show an adaptability in form and function which makes their study especially interesting and fruitful. They are on the borderline, with characteristics which place them in the classes of both plants or animals. In the large class of bacteria we find representatives which utilize, as forms of energy, certain constituents of the substrata, such as, cellulose, sulphur, urea, etc., to such an extent that they provide practically exclusive conditions of growth.

Others get along better in mixed cultures. To demonstrate the extreme variability of form and function, we might mention as an example the Azotobacter, which is characterized by the morphological and physiological behavior of seven different cell types which could all be transformed into each other.

1. Large, non-sporulating, globular, oval, rod-like cells of white, yellowish or brown color with polar or peritrichous flagella.
2. Small, spherical, "Coccoid" cells of white, yellow or pink pigmentation, the vegetative growth of the regenerative bodies.
3. Dwarfed cells of yellow, white and red color, the vegetative growth of the gonidia.
4. Irregular, fungoid cells, producing a yellow, orange, white or pink growth.
5. Small, non-sporulating rods of white and yellow color.
6. Small sporulating rods.
7. Large sporulating cells growing white, yellow and brown.

Thus it was shown by Löhnis that the different development stages of Azotobacter could be in part identified with certain so-called species belonging to the form genera Micrococcus, Bacterium, Pseudomonas, Bacillus and Mycobacterium. A sketch is submitted to show the various forms in addition to an unorganized slime mass (symplasm).

The attempt to obtain cell-division, and thus vegetative reproduction, in these unicellular organisms has been altogether successful. Several workers, among them the author himself, in his work with urea bacteria, has produced, by frequent transfer of culture to culture, thousands of generations of bacteria through vegetative reproduction only. Thus these cells, multiplying through simple division, may justly be considered as immortal organisms, always giving off some of their plasma to the cells of following generations.

Abnormal Growth.—The growth of organisms on unusual substrata often brings about peculiar adjustments in form. Such modifications have been until recently referred to as involution forms, now they are known as chemomorphoses. A form transformation may readily be observed on such micro-organisms as Protozoa, which through altering the composition of media and modification of temperature, may assume different shapes, and may move either more lively upon rise of temperature or remain altogether stationery upon cooling of the substrata.

That, through changing of the substrata, the products of metabolism may be greatly altered, has been strikingly shown especially by Carl Neuberg, who grew yeast in alkaline culture media and thus produced glycerine up to 14 per cent.

Many methods of differentiating lower organisms, *e. g.*, by formation of gas, acid, enzymes, pigment are based on the significance and use of specific culture media.

FIGURE 4.

Need for Lime (Calcium) in Animals. Rats of the same age—on experimental diets for about five weeks. Diet high in calcium, low in calcium. (After Mendel. X-ray-photograph after Mitchell.)

IV.

Higher Organized Forms.

Normal Growth.—In the higher organized plants and animals we observe increased differentiation of cells, and an increase in tissues with specific functions. Cells, as plant fibers and muscle fibers, having similar functions of strengthening, have also similar structure. All cells start normally through division of the egg-cell; meristematic or embryonal tissue then develops and all the cells needed in

the metabolism of the organisms are subsequently formed. The increased differentiation permits of a complicated mechanism; it demands, however, continual co-operation of all parts and has also the disadvantage of decreased power of regeneration.

The aging of cells and tissue, which cannot be stopped, ultimately brings about a degeneration, an inability to function properly, and a general breakdown. An example of aging is the destruction of nerve cells, illustrated below.

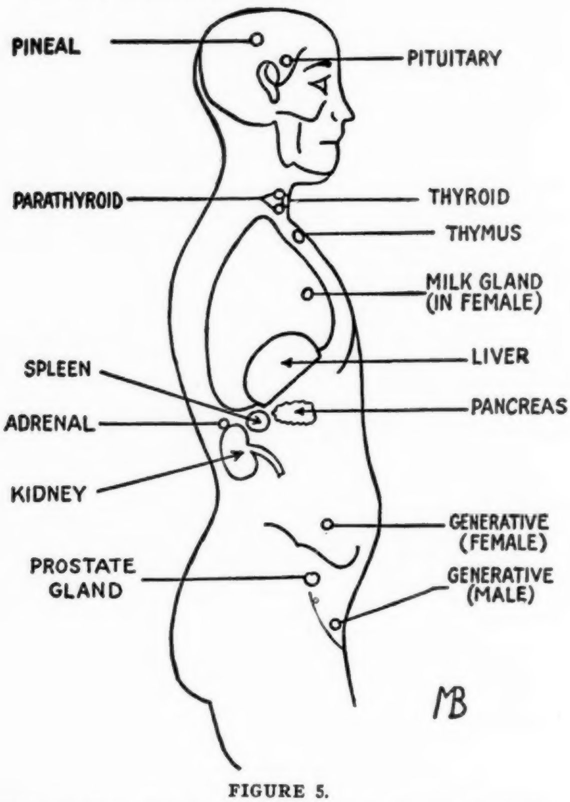

FIGURE 5.
Schematic Chart of the Endocrine System. (After Kammerer.)

Of interest is the varying age of organisms. We all know annuals among the flowering plants, and others which flower, fruit and die in the second year, still others, perennials, with an indefinite life period.

That death, through disease and other causes of accidental destruction, shortens materially the normal life period is well known.

Among the lower plants or animals, we have learned to know the bacteria and other unicellular organisms which we can consider as immortal being. Among the more highly developed organisms, one plant, the California Redwood tree (Sequoiagigantea), has withstood all the forces of destruction, except that of man, for at least 4000 years. The dragon tree (Dracaeno draco), of Orotova on Teneriffe, and the water cypress (Taxodium Mexicanum), growing near Oaxaca in Mexico, bear witness of over 6000 years of existence.

The life period of animals, as that of man, varies greatly. A recent tabulation is included, which, through the placing of question marks, illustrates also the doubt concerning the possible ages. From critical surveys one must conclude that the life period of man at best only slightly exceeds the century mark. Reference is also made in the table to the cephalization factor suggested by Friedenthal. It expresses the relation of the weight of the brain to that of the living body (substance). The highest factor is obtained in the case of man; it decreases with lowered intelligence of animals. The most intelligent animals evidently live longest.

MAMMALS.

Species.	*Cephalization—Factor.* $\frac{\textit{Weight of Brain}}{\textit{Weight of Living Substance}} = \%$	*Maximal Life—Duration (According to Hanseman) in Years.*
Man,	2.67 to 2.81	80 to 150
Elephant,	1.24 to 1.34	90 to 100
		150 to 200*
Anthropoid Ape,	0.76 to 0.65	50 to 60*
Horse,	0.43 to 0.57	45
Deer,	0.40 to 0.50	30
Bear,	0.36 to 0.50	50
Dog,	0.34 to 0.51	15 to 20
Cat,	0.29 to 0.34	20
Oxen,		
Giraffe,	0.30 to 0.40	30
Antelope,		
Squirrel,	0.16 to 0.20	6
Insectivora,	0.06 to 0.18	6 to 10
Mice,	0.04	3

*According to Korschelt.

BIRDS.

Species.	*Cephalization—Factor.*	*Maximal Life—Duration (According to Hanseman) in Years.*
Carrion Crow,	0.168	100 (?)
Parrot,	0.147 to 0.177	100 (?)
Alpine Crow,	0.114	50
Buzzard,	0.11	...
Owl,	0.113	50*
Finch,	0.086	8
Sparrow,	0.086	...
Duck,	0.0731	...
Snipe,	0.0585	...
Quail,	0.0495	...
Heron,	0.0459	15
Pheasant,	0.0343	15
Fowls,	0.0249	10 to 20
Ostrich,	0.0195	...

Abnormal Growth—Cancer.—As an example of disease, affecting both plants and animals, cancer may briefly be mentioned, inasmuch as it presents uncontrolled growth-unbalanced development. It has also been referred to by Erwin F. Smith as a phenomenon of continually interrupted healing. One of the causes of plant-cancer, resembling in many ways that of animal tumors, has been shown to be a micro-organism (Bacillus tumefaciens). "We were two years trying to isolate the parasite of crown gall," says E. F. Smith, who has been so successful in his studies of plant-cancer. He inoculates young plants by introducing the germs in buds and other embryonal tissue.

The cause of animal cancer is definitely attributed now to various causes: Filterable virus, worms (cockroach and angleworm nematodes), coal tar preparations, anilin dyes, nicotine and most recently, according to English claims, to an ultramicrobe. Skin tumors, through the frequent application of tar products to the skin of the ear, are more readily produced in pregnant animals, as was recently demonstrated to the writer in the Ehrlich Institute, of Frankfurt, Germany. That the milt plays an important role in the development of animal cancer was recently advanced by .

Cancers of the lip and tongue are, it is also claimed, caused by nicotine, as a result of excessive smoking.

*According to Korschelt.

V.

Experimental Growth.

In the discussion of experimental growth we might well think first of the experiments which have led to a change of sex both in plants and animals.

The work of Correns and others has shown the distinct influence of age of flower pollen (Melandrium) upon the sex of the following

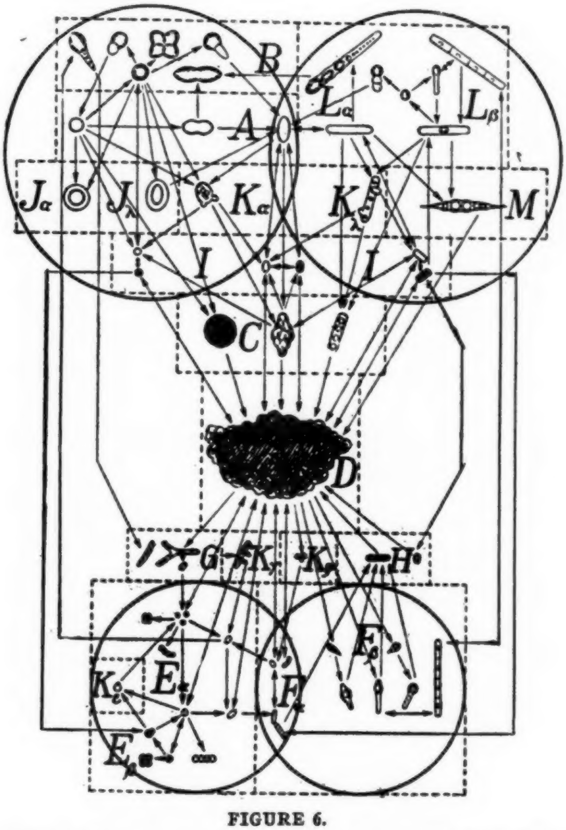

FIGURE 6.

Lifecycle of Bacillus azotobacter. The broken straight lines divide the different types of growth indicated by the letters A to M. The Greek letters α to λ refer to subdivisions. The single- and double-pointed arrows indicate the development of one form from another. The four circles confine, in every case, all those forms which represent together a rather constant mode of life and which have been usually considered as bases for establishing separate species. (After Löhnis and Smith.)

generation. The older the pollen, the more male plants were produced. The age of egg cells evidently had no influence.

Even more interesting is the work of Steinach with guinea pigs, changing their sex characteristics at will by transplantation of sex glands. Worthy of note here is the success of Loeb in the chemical stimulation of sea urchin eggs with sapronin, a substance reducing the surface tension of the liquid and causing the development of the egg, or his work effecting the artificial parthenogenesis of a frog.

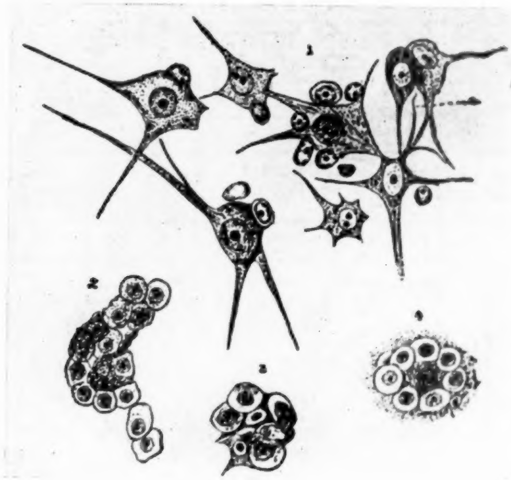

FIGURE 7.

Aging of Cells and Tissues. Nerve cells surrounded by neurophages—phagocytic cells, by which they are gradually destroyed. This form of phagocytic activity only occurs during old age. (After Metchnikoff.)

Regeneration.—The possibility of regenerating tissue, both vegetable and animal, is so well recognized in certain quarters that methods have been worked out, which are applied on a constantly growing scale. The processes of pruning, budding and grafting in plants are but forms of regeneration. As many as 137 different forms of such regeneration have been counted. In nurseries and commercial greenhouses these methods are generally applied. I mention only the benefit to fruit growers, who thus have a means of growing varieties best suited to their particular conditions. The wide distribution of California privet hedges is only made possible by the fact that branches detached from the bush may readily be rooted

and produce new plants. There is evidence that embryonal tissue is well distributed in plant life, which tissue will develop to new organs should conditions be suitable for bringing this about. Of interest in this connection is that the author succeeded in producing new growth on a digitalis leaf completely detached from the plant.

Speaking about tree surgery, Peets in his new book on "Practical Tree Repairs," emphasizes the importance of the cambium layer—a very inconspicuous, soft, moist layer between the bark and the sapwood.

"The cambium layer is the great fact to the man who is doing tree repairing. If an accident occurs, his first thought is of the cambium. If he is making an incision or filling a cavity, one eye must be constantly on the cambium. He must learn all its wills and wonts, what it does and how it does it, what can be done to it and what can not.

"For the cambium is the only growing part of the tree (besides the young leaves and the tips of twigs and roots) and if growth is to be made the cambium must make it. It is the vital, growing cambium which each year lays on a thin, strong layer of new wood over the whole surface of the frame of the tree, which builds out a tough shield of bark to protect itself and the wood beneath it. It is the cambium which heals wounds and covers over cavities." To emphasize the marvellous function of the cells, which form the cambium or other embryonal tissues (thin walled, undifferentiated, plastic, unencumbered by vacuoles and secretory inclusions), the author is tempted to refer to them as the "divine" cells.

In animal life various forms of regeneration are possible. In the lower organisms, even from small parts, complete regeneration is possible, provided the nuclear constituents of the cell are transferred.

Budding is readily observed in the development of hydra or seastar branches, grafting in the case of tadpoles joined together in various ways. Regeneration of skin, nails and hair in human beings is a well-known faculty of human tissue. Transplanting of bones, of skin and even of kidneys and eyes (for animals) has been accomplished. Facial surgery has accomplished wonders in restoration.

Voronoff transplanted ape glands and human glands on human beings. He placed the right lobe of an ape's thyroid with its parathyroids in the little cell which should have been occupied by the missing left lobe of a boy, fourteen years old, whose general condi-

tion of health was very poor and whose intelligence was far below that of children of his own age. The results were very beneficial and lasting as far as an examination fourteen months after the operation could indicate. Another operation, transplanting the thyroid lobe from the mother, forty years old, to her suffering boy, resulted also in a physical and intellectual progress, though this was far more gradual than in the case of the graft of a young, three month old, ape's gland.

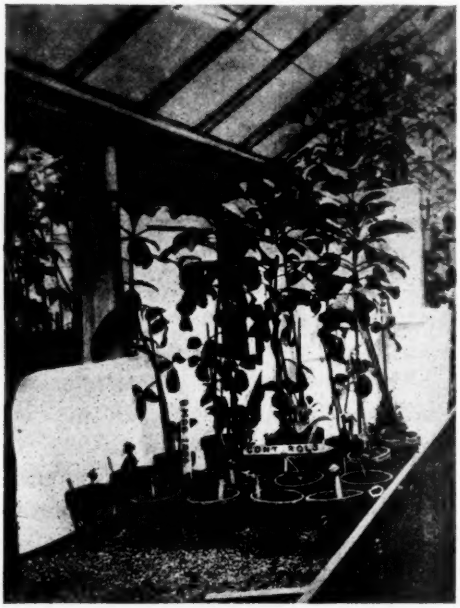

FIGURE 8.

Plant Cancer. Crowngall inoculations on one of the two Lifeplants (Bryophyllum calycinum). Bacterium tumefaciens, plated from a peach tumor, was introduced into the terminal bud region of young plants, which were dwarfed and killed within nine months—while all controls showed vigorous growth. (After Erwin F. Smith.)

Rejuvenation.—The process of rejuvenation through vegetative reproduction and frequent transfer to new nutrients has been mentioned for bacteria. Many successful experiments of regeneration constitute rejuvenation. We have rejuvenation of tissue, if we remove parts of tissue, as, for instance, the leaves in lettuce, grass blades in lawns, parts of geranium, begonia or ageratum.

That transplanting rejuvenates tissues has already been mentioned. The exposure of plants, especially buds, to radiation of Roentgen rays, has a conspicuous stimulative effect on them.

The process of aging in plants is little understood. In some plants full maturity, expressed in flowering and fruiting, terminates

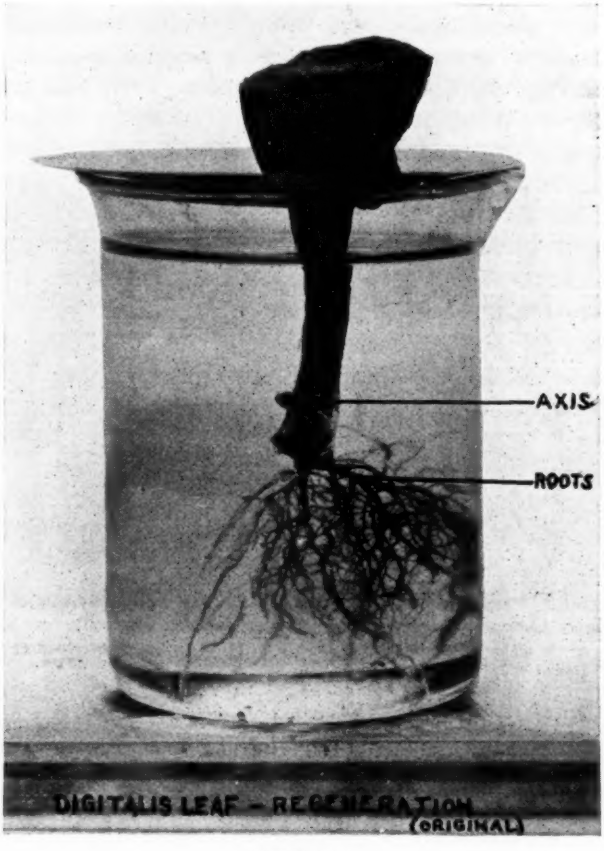

FIGURE 9.
New Growth on Base of Leaf, Completely Detached From Plant.

the life cycle. If we delay this maturing and fruiting we may keep the tissue alive much longer. That through continued vegetative growth, the relative vein tissues formed become smaller, is pointed out by Benedict, who experimented with grapes, and examined tissue from plants, three, eight, fourteen, twenty-eight and sixty years old.

Similar observations were made with leaf-vein tissue of willow, chestnut and other trees. The intensity of carbon dioxide assimilation and respiration, and the number of stomata are reduced with increasing age. Vegetative reproduction of fruit trees also finally yields trees which show signs of age, through slow growth, sensitivity to climate and soil—degeneration of the strain.

Here is where, likely, sexual production, a joining of the male and female sex cells, must take place to produce anew the "divine" embryonic cells for the sake of "lost virility."

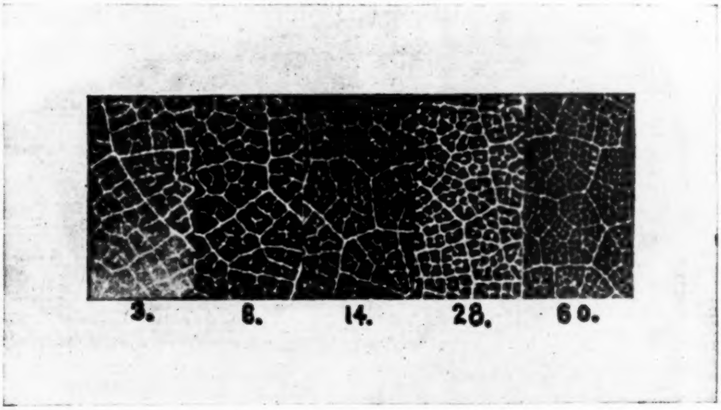

FIGURE 10.

Degeneration Through Continued Vegetative Reproduction. Grapevine (Vitis vulpina). Leafvein tissue of young plants becomes constantly smaller, as shown in the illustration of tissues from 3, 6, 14, 28 and 60 year old grapevines. (After Benedict.)

In rejuvenation of animal tissue various methods have been used, *paralleling* nature's feat, triumphing over old age with sexual reproduction. Steinach and Holzknecht, with the use of Roentgen rays, acting upon the generative glands (ovaries), advanced the state of maturity in immature guinea pigs and rejuvenated aged glands of women.

Voronoff writes in his book, entitled, "Life," concerning his experiments with goats: "I can affirm that some goats for two years and others for three have enjoyed good health which they did not possess during the years immediately preceding the graft, that some among them have procreated young, something they had been altogether incapable of doing for a long space of time, and that instead of pitiful beasts, timid and dejected, showing the marks of senile

decrepitude, they have once more become superb animals, full of spirit, aggressive and belligerent. And since I have seen them in their wretchedness, and the only treatment given them has been the grafting on them of sex glands taken from young animals, I am convinced."

Harms experimented mainly with dogs, transplanting the sex-gland of a three-month-old male dog or on a sixteen- or seventeen-year-old dog that was almost dying from weakness. The transplantation had a greatly stimulating effect, which through two subsequent transplantations of gland tissue from the same animal was retained practically until rather sudden death 200 days later.

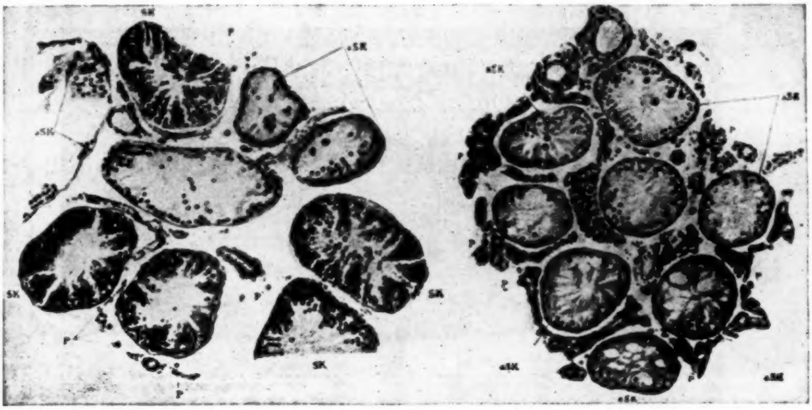

FIGURE 11.

Rejuvenation of Rats. Generative glands of Senile male rats (Microscopical section). Left picture: Senile condition. Right picture: Revivified condition after ligation of spermatic duct. aSK—Seminal canals in the process of perishing. Interstitial tissue (P) in right picture decidedly better developed on account of ligation and replacing empty spaces in senile glands. (Steinach.)

Steinach used a different method, discussed at length by Kammerer in his book on the prolongation of human efficiency. "As a result of experiments with rats from the same litter, the fact was established that the rejuvenated brother always lived seven to nine months longer than the brother that had not undergone a ligative of the spermatic duct. As the average rat hardly ever lives longer than thirty-one months, the postponement of the probable time of demise amounted to about one-fourth of the average length of a rat's life." Concerning the effect on man he states, "It is one of the foremost symptoms of rejuvenescence, brought about by vasoligature (cutting

and tying of the sperm duct) that in cases where poor teamwork of the glands disturb the general health of the patient, this teamwork is improved; a glandular equilibrium, so to speak, is brought about by the Steinach operation and with this a general improvement of the patient's condition." (See also illustrations.) Haire in his new book on rejuvenation in general agrees with Steinach.

Voronoff, equally enthusiastic as Kammerer in regard to rejuvenation, states: "The surgery of the future lies in the grafting of our organs, our tissues and our glands. The ideal toward which our efforts tend is to preserve life in the plentitude of its diverse and multiple manifestations, to force death to retract to its farthest limits."

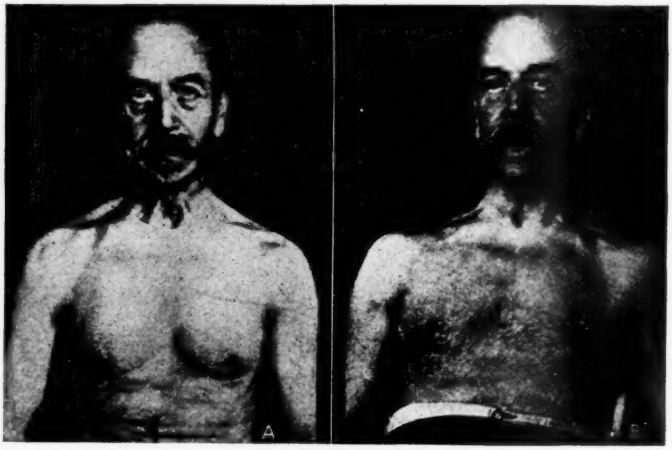

FIGURE 12.

Rejuvenation of Man. A. Fifty-six year old patient before the Steinach operation. B. Four months after the Steinach operation. (Ufa-Steinach-Film.)

Many workers, in contrast, have expressed their doubts concerning rejuvenation, and even reported failures as result of their experiments carried out with methods mentioned, or with extracts from generative glands.

The interesting chapter is not closed—the fight for youth is going on!

VI.

Biological and Economic Significance.

In discussing growth and the conditions which affect it, favorably or unfavorably, we have come to realize the progress which has

been made in the understanding of life and the process of development in particular. We know now that most complicated chemical and physical changes continually take place in living cells. If we modify but one phase the entire system is bound to be altered. Actual knowledge replaces more and more the fear of the unknown. The microscope has enabled us to solve the mystery of transmission of many diseases.

The closer co-operation—now in the forming—of the best minds, chemists, biologists, physiologists and all representatives of the other branches of natural science, tends to ultimately bring about the complete mastery of science of life. The protection of forests, waterways and of fertile agricultural land from industrial indifference or greed is under way. Many problems of disease and general welfare are already solved. The need for adequate nutrition is recognized. The proper functioning of the body glands is known to be essential.

Physical and mental development is coming under the control of man. Not only is he learning to maintain his health, to extend his span of life, but he is sensing his ability to engineer the growth of animals and plants according to his need and taste, to apply nature's laws—and to more fully utilize nature's products, nature's resources.

Man begins to appreciate his partnership with the Cosmos and to feel his unity with the universe.

"The Fifth Estate is composed of those having the simplicity to wonder, the ability to question, the power to generalize, the capacity to apply. It is, in short, the company of thinkers, workers, expounders, and practitioners upon which the world is absolutely dependent for the preservation and advancement of that organized knowledge which we call Science. It is their seeing eye that discloses, as Carlyle said, 'the inner harmony of things; what Nature meant.' It is they who bring the power and the fruits of knowledge to the multitude who are content to go through life without thinking and without questioning, who accept fire and the hatching of an egg, the attraction of a feather by a bit of amber, and the stars in their courses, as a fish accepts the ocean."

ENVIRONMENT—THE BIG FACTOR IN HEALTH AND DISEASE.*

By Louis Gershenfeld, Ph. M., B. Sc., P. D.

Professor of Bacteriology and Hygiene.

The more intelligent the individual the more varied will be his definition of a word or words. There is little doubt in my mind, however, that the meaning of the two words, health and disease, is clear to all.

Health is a condition which we all admit is desirable. Disease is undesirable.

What is it worth to you that you and yours should not have this or that disease? Can you realize what would be the increase in the sum total of human happiness, and the well being of every individual socially and economically, if disease were to be banished from earth? Indeed, it is almost impossible at present to place a value on public health work, and the old adage, "Public health is public wealth," still rings true.

Many individuals go along blindly in the path of their ancestors. Sooner or later some bitter experience proves to them conclusively that the old methods are all wrong. Knowledge about one's self never does harm. Health data is information of constructive usefulness and something which is more than merely facts. It is something that can make one happy. Ignorance of health facts is not a bliss. It will turn out to be not only expensive but, frequently, grave consequences may result.

I am willing to agree that some of these health problems are to be solved solely by the individual, but without the aid of knowledge and the understanding of these facts, a wise solution is impossible by any individual. Remember that understanding goes before improvement. To do good, one must know what good is.

Intelligent and valuable information concerning health should not be denied by ignoring its existence. Either we must look at conditions as they are and try to combat them intelligently, or we will have to continue enduring the tragedies that result. It is a pity, but nevertheless a fact, that many persons are lost because of their ignorance.

*One of a Series of Popular Lectures given at the Philadelphia College of Pharmacy and Science, 1925-1926 Season.

Death is inevitable. Disease need not be.

Why should man, who is always striving and facing destiny in a manly way, be confronted by disease? By finding remedies to combat the latter, there is conferred on mankind that most invaluable gift—health.

We speak of educating the unfit. But why not educate the fit before they become unfit? Unfortunately the unfit are frequently helpless, careless, always indifferent, often not intelligent, and unreliable. The truth of the matter is that the greater injury to life results from the general public, who are healthy and fit. Harm results to the community from the indifference of this big group. They show neither interest nor desire to know the scientific facts relating to health, and are either selfish, stupid, indifferent, or they do not have the conception of life in the sense they are merely one of many millions existing as a part of a co-operative body in this universe. Interest in health problems on the part of the public will aid considerably in controlling disease conditions and in reducing death rates.

Science attempts to do away with thoughtless and indifferent custom. Its aim is to help humanity a little more knowingly than in the past. Its fondest wish is to give everyone the possibility of mutual joy which can be attained by a healthy body and a sanitary environment as essential requirements.

That a man is subject to more diseases than fish or even lower forms of life does not prove that the fish is the higher form. We alone are responsible for many of the unnecessary diseases that we have to endure. The more intensive our lives, the more severe will be the contest with disease.

We differ from the lower forms in many essential ways. Both have the physical body. Only slight progress is made by the lower forms and what little they possess is transmitted from parent to young. Human development goes further. In addition to the use of our greater developed brains, our hands are at our service.

We react to the influence of environment as do other animals. But we have initiative—nature's gift to man, which enables him to modify or change his environment and to govern his conduct and even impulses by ideas. There is a great deal of truth in the statement that health is what you make it. Happiness and progress of man depends so much upon his own actions and behavior.

It is within our power to make this world a far more ideal place by contributing to the development of a better race—surely improving from generation to generation.

It is unfortunate, but nevertheless true, that we pay more attention to the raising of good cattle, horses, yes, even hogs, as well as other animals, than we do to the raising of the right kind of people. This is due to the fact that animals are regarded as property and we have always cared more for the protection and preservation of property than of human life.

If it were a question of a weak department in a big business enterprise, experts would be called in at once to remedy the situation. Something would be done immediately to prevent wrecking the entire business machine.

One's auto is overhauled at frequent intervals in order to get the best and most out of it. Many individuals, however, never stop to give a little attention to themselves (human machines that they are), or to their surroundings. They then wonder why their production is affected. We expect or demand soundness of everything. But we fall short of this standard when we deal with the body and actions of humans.

Many are unfit who could develop, but they are either condemned or voluntarily place themselves in surroundings that are not conducive to decent and healthy life.

Man is the most adaptable of all species. He also has the greater capacity for modifying the environment to suit his needs. At times he is even capable of going one step further. He can devise means whereby he can make his environment subservient to him. Wielding such power, humans can and should make their living better, happier, easier, but instead, they continually check their own development by their actions. There are many factors which operate directly or indirectly to bring about disease. One can divide these into the immediate causes, which are direct, and the remote causes, which are indirect. The latter operate in such a manner as to reduce the resistance or physical powers of the human body and thus make it possible for disease conditions to set in.

One may also conveniently divide the causes of disease into the predisposing and the exciting causes. In the former group are included those conditions which were previously mentioned as remote causes, and embracing such factors as ventilation, sunlight, climate and atmospheric conditions, food, drink, clothing, fatigue, etc. There are also other important factors included in the predisposing factors to disease.

These are sex, age, hereditary and family influences, density of population, occupation, sanitary conditions of environment, etc. One

can see that environment controls directly and indirectly many of the factors that are grouped as the predisposing causes.

The exciting causes of disease are the actual agents producing the disease. They are the same as the immediate causes, which include, (a) physical causes, brought about by injuries, burns, etc.; (b) chemical causes, such as contact with poisonous chemicals and drugs, etc., and (c) the vital causes. The latter include the invasion of the specific elements or agents that are the causative agents of disease.

The actual invasion of the infective agent is indeed a potent factor. But sanitary environmental conditions can reduce the presence of these agents to a minimum. And again, the power that an individual may possess to resist the aggressive inroads of the infective agent is as great, if not a greater factor, than the presence of the causative agent. It is surely a greater factor than is realized by people today. Here again may I state that this resistant factor is greatly enhanced or reduced by environmental conditions.

It will be impossible for me to attempt to cover in detail this subject in the limited time allotted here. I will consider at this time those important environmental factors which humans can control and modify. The main purpose of this talk is to bring it to your attention and interest you to study it further, as should be your duty as a member of a community. It is strange, but nevertheless a fact, that individuals expect their local health authorities to protect them completely against disease. They themselves give but little assistance in attempting to protect themselves. Few appreciate the trouble taken to insure good health in a community. Others, on the other hand, overstep their boundaries. It reminds me of a statement made in "A Budget of Paradoxes": "A person of small knowledge is in danger of trying to make his little do the work of more; but a person without any is in more danger of making his no knowledge do the work of some."

Your familiarity with many of these environmental factors is such that mere mention of them will suffice. There are others, however, which will be considered more fully so as to bring to your attention various facts which concern you and the community at large.

Why should it be necessary in these modern times to remind people of cleanliness, or the value of tidiness? Personal or private cleanliness may be on a high plane in this country today. But the same cannot be said concerning the tidiness of our surroundings. In the treatment of the latter we have much to be desired. A great por-

tion of this can be traced to care-free citizens who either are unwilling to co-operate or are naturally careless.

Unhealthy surroundings and overcrowding are the most important of these environmental factors. The important problems that concern health authorities so as to make our surroundings a fit place to live in are:

Water Supply.

Water is one of the indispensable requirements of life. The water we drink and the water we swim or bathe in may be the source of considerable trouble. Typhoid as a disease caused by polluted water is well known to you all. The relation of polluted water to outbreaks of cholera, dysentery, and other intestinal diseases is well established. These diseases have been virtually eliminated in communities where the water supply is carefully watched.

Milk Supply.

Milk is one of the most frequently used articles of food. A number of diseases may be conveyed through contaminated milk. This may be derived directly from the cow, but more frequently from the utensils, or those who assist in the collection and marketing of the product. Scarlet fever, streptococcus sore throat, diphtheria, typhoid fever, dysentery, cholera, diarrhœal conditions, and probably tuberculosis, have been traced to impure milk supplies. Mortality among bottle-fed children and milk-borne diseases in humans have been markedly reduced by the present methods of sanitation practiced in the milk industry.

Foods.

By taking care of plant and animal life, we obtain all the food necessary for humans on this earth. By caring for and improving humanity in the same manner, a continuous and cumulative progress will result. Any food may be contaminated by organisms that will produce disease of one kind or another. Such contamination may be due to infected food, or it is more apt to have become unfit during its preparation for the market.

Other than the introduction of actual infective agents, poor foods (*i. e.,* foods low in nutritive value), produce improper nourishment. This, in turn, may retard physical and mental development.

Health authorities are therefore interested in foods to see that they are perfect, not adulterated or contaminated with micro-organisms or poisons. They are compelled to watch not only the producer or manufacturer, but also the shipper, to see that the product is preserved properly. Restaurants, markets, storage houses, the quick lunch house, the soda fountains, the street vendors and all food handlers, are kept under observation. General sanitary, as well as personal hygienic conditions, are investigated during frequent inspections. The sanitarian guards the quality of the food until it reaches the consumer.

In the proper care of foodstuffs, we have many eloquent and practical exhibitions of the way in which disease may be reduced by scientific methods of environmental control.

Sewage, Garbage and Waste Disposal.

Sewage must be treated so as to reduce to a minimum its content of infective agents and the offensive and poisonous products of decomposition. Sewage discharged into waters or environments that because of tide, current or other means, may be eventually deposited on the shore or soil, upon oyster beds, or find its way into our drinking water and foods, will endanger not only our comfort, but also our health, unless disinfection of the sewage is practiced.

From the sanitary viewpoint, garbage is a nuisance, inasmuch as it forms a favorable breeding place for flies and other pests. Its decomposition results in the production of disagreeable odors that will pollute the atmosphere.

Ashes, refuse and other waste material, unless properly taken care of, may act as a nuisance and a menace to our health. It is to be regretted that the collection of garbage, ashes and waste and their disposal in many of our communities, are unsanitary. Many of the disgusting sights and smells can be eliminated. We have not yet reached the same perfection from a sanitary viewpoint as is practiced in many of the European countries in the disposal of waste.

The utilization and purification of manufacturing wastes, the elimination of offensive odors, smoke and dust, from our atmosphere and the ever-increasing annoyance of objectionable fumes from automobile exhausts are the great pollution problems facing the health officer. Measures, especially those measures favoring a proper restraint on trade wastes pouring into streams have been criticized and have received all kinds of snags, and as a result progress

is very slow. Additional experimental data, more earnest co-operation and severe punishment of habitual offenders, are needed to make our water supplies and our atmosphere safe and free from impurities.

During recent years much has been done to reduce to a minimum dust-laden atmospheres as may be found in the work shops of certain industries. This has resulted in a marked lowering of the frequency of disease among the workers. The results would be the same in our cities if the community at large would demand as well as co-operate in reducing the pollution of our atmosphere.

Ventilation, Lighting and Heating.

Natural ventilation, favored by the intelligent opening of windows, etc., will keep the air of homes and small buildings reasonably pure without causing discomfort. Artificial ventilation may fortify natural means when the latter are inadequate. Sound scientific experimentation has replaced guesswork. As a result effective remedies for bad ventilation have been made possible.

The proper lighting is of great importance not only in the home, but also in industries; in fact, everywhere. In many of our modern establishments ventilation and illumination are as perfect as science can make them. This benefits the worker, whose efficiency is improved.

Remember that foul air and darkness or poor lighting will sap the vitality of any thing that grows.

Heating must always be considered in connection with ventilation. Custom, occupation and the effects on air circulation are some of the influences which affect the methods of heating. The value of this on our health can be readily appreciated.

Contagious disease control, through quarantine, isolation, vaccination, disinfection where practical, hospitalization, etc., have accomplished much in reducing the terrors of epidemics. The result and accomplishments here alone justify the continuance of public health work.

The dead (especially those who have died of contagious diseases), as disseminators of disease, is a factor which is frequently overlooked. Burial within twenty-four hours should be practiced if embalming is not performed. Ice-box refrigeration for cadavers who have died from contagious diseases, should not be allowed, especially if a public funeral is to be held. Cold does not kill infective

agents within the short time that a body is generally exposed. Chemical disinfection, as in embalming, actually kills.

The housing problem is and always will be a factor in the health progress of the individual and the community. Room and land overcrowding, general cleanliness, water supply, drainage, plumbing, disposal of all waste, exclusion of insects and other pests, light, ventilation, heating and humidity, are some of the essential features of proper housing. It is true that the solution is partially economic, but this should be made a secondary consideration. Civilization as a whole directly benefits by the correction of any condition that affects the health of a portion of a community or even one individual. The ultimate gain always justifies the expense toward obliterating sources of disease. There is this to be said about the homes of the poor. They may be shabby, but they can and should be kept clean. Shabbiness may signify distress, but dirt and filth generally signify carelessness.

Few individuals will associate plumbing with health work. Yet it is a fact that modern sanitary plumbing has developed primarily as a health necessity. Not only does this make living conditions better but poor plumbing resulting in leakages may show a relationship to some diseases. It was not so many years ago when the old lead pipes were also instrumental in producing disorders in humans due to the accumulation of the lead dissolved by the water which was consumed.

The ridding of homes and environments of insects and all pests is of great importance. This is due to the fact that the latter are not only annoying, but they may be disseminators of disease. A proper system of surface drainage for the eradication of mosquitoes, screening, proper covering and disposal of garbage, rubbish and decaying vegetation, general cleanliness in and around the home, and the proper use of exterminating agents are some of the important features that are being employed in the campaign aiming towards the elimination of pests of all kinds.

Industrial Hygiene.

The importance of hygiene, sanitary inspections, medicine and surgery in industry should be strongly emphasized. Excellent work has been accomplished in making factories, shops and everywhere where we work more sanitary. This has resulted in (1) constant health supervision, (2) periodic physical examinations, (3) selective

work according to physical qualifications, (4) adequate sanitary, medical and surgical care, (5) prevention of disease and accidents.

There are specific hazards, direct or indirect in every occupation, but proper safeguards will help greatly to reduce these to a minimum. Just as important, however, is the personal element among the workers. Their habits, rest, amusements, other living conditions and home environments generally influence their activities in the workshop. Teach them the importance of personal hygiene and general sanitation in the home and in their daily routine, and you will find that there will be an advance in the conservation of life and in the efficiency in the various industries. Just as safety devices need to be supplemented by safety education, so the actual practice of hygiene and sanitation needs to be supplemented by health talks and health educational data. Such education will impress on the individual worker his responsibility not only for his own health and safety but also for the health and safety of others.

Most employees have learned to appreciate the value of health talks, physical examinations, data concerning sanitation, safety, general welfare and related matters. Workers in industrial establishments have benefited by the efforts made by health officials and the industrial employers.

Nuisances and Accidents.

The number of individuals who are disabled by accidents in industries and in civil life is much greater than need be. At least three-fourths of all accidents can be prevented. Safety measures, legislation and education have helped and is helping to reduce accidents in many of the industrial plants. Similar progress can be attained in civil life where accidents, due especially to traffic conditions, are assuming more importance. Safety education will help, but a greater aid will be the development among individuals, through education, of a higher sense of responsibility and appreciation of their own bodies and the lives of others.

The abatement of nuisances was at one time the chief work of the health officer. Today, with better sanitary conditions, the latter are generally turned over to others. However, the public still demands, and perhaps rightfully, that health officials shall supervise or at least give some attention to these nuisances.

A common nuisance which needs immediate attention is the excessive noise which is prevalent everywhere and especially in cities,

due to the increasing automobile traffic. Much of this is needless. As soon as we begin to realize that this nuisance is not necessary and a definite campaign to educate people to such fact is begun, much of this noise will be reduced. The result will benefit our health, comfort and happiness.

Litter or scattered rubbish is one of the inevitable consequences in communities, where you find overcrowding, careless citizens, inadequate and poor methods for the disposal of waste and poor facilities in not having receptacles at convenient places for the collection of rubbish.

It is hard to understand why individuals have very little consideration for tidiness and rarely participate in any responsibilities in their use of public grounds, especially parks, bathing beaches, playgrounds, etc. After a crowd has left one of these places, it resembles a rubbish dump. It is even becoming a common sight to see paper and refuse thrown from passing automobiles. The occupants don't seem to care to deposit the wrappers in designated receptacles. It is better for their personal convenience to throw them into the highway and let others be inconvenienced. Their comfort is not affected. Such a nuisance calls for disciplinary action. Punish the offenders and strewing of rubbish along our highways and public places will stop quickly.

Serious attention also should be given to better methods of collecting our waste. Much of the rubbish along our highways can be traced to vehicles on their way to unload wastes collected in other locations.

Some of the other nuisances which may affect the health of individuals and which health authorities are called upon to investigate are:

Sanitary condition of slaughtering houses, stockyards, cemeteries, privy vaults, manure piles, pig pens and other animal abodes, when these are found in or close to the living quarters of humans.

School Hygiene.

The protection of the health of the students, especially young and immature children, necessitates strict observance of all sanitary principles, but especially the following: Location and erection of school buildings, heating, lighting, ventilation, arrangement of desks, seats, and other furniture, and general cleaning methods.

Routine inspection of school children by competent medical investigators has been very beneficial to the students and the community. Sound minds need sound bodies. These inspections have accomplished much in making this principle a recognized fact. The relation between physical and mental efficiency is well established.

There are many problems which health authorities have turned over to others in specialized fields who have assumed the responsibility of caring for the sanitary aspect of their respective duties. Thus we have the plumber, the engineer in ventilation, lighting, etc. Though such procedure has proven successful in most instances, there are times when health authorities should make closer observations and take cognizance of mistakes. For instance, we all know that there is an overcrowding in our schools today in most large communities. Children and students are placed in rooms and buildings that were built to hold smaller numbers than are crowded into them. Under such conditions, the risk of having young children subjected to epidemics is great. Some of the educational authorities err in their plans. Instead of having two or more smaller segregated buildings in a community to house students, especially young children, they build one large school or erect additions to existing structures. I think if all factors are considered, such arrangement is not a saving but actually a financial loss to a community.

Another mistake which is made by some school authorities is in failing to arrange a proper adjustment of curriculum to the mental and especially the physical power of the students. I find, for instance, that in certain quarters where young children have half sessions, due to lack of room, many will be in attendance virtually the entire afternoon. During the cold months, the parents cannot leave them out in the morning, and in the afternoon when it is warmer and the sun is out, they are compelled to stay in school. Their rest is frequently disturbed. A more suitable arrangement can and should be made especially for young children.

Our health authorities should realize that it is their duty to compel the school boards to establish a more suitable arrangement of curriculum which will be compatible with better health, especially for youngsters.

Child Welfare Work and the Home.

Children are the most valuable asset of a community. We must look to youth for the making of a better and brighter world. Anything which tends to improve their health and prevent disease will

help greatly to promote the best interests of the present and future generations. Race improvement is only possible through the child.

Every period of a child's existence has been and is being investigated thoroughly, so that the best conditions may be produced for the development of healthy citizens.

Health taught to children by means of a game, a story, in a play or movie or by other activities as is being taught is bound to bear fruit.

Child welfare work is producing social, industrial and political effects which were not dreamed of in days gone by. The saving of children's lives will increase the span of the expectancy of the average duration of life of humans, and a proportionate financial gain to a community will result. There also will be an increase in the number of available workers in industrial pursuits accustomed to American ways and standards. The standard of living will rise. The number of dependents of one kind and another will be reduced. And besides, can we even think of talking in terms of financial gain when one attempts to consider the pleasure adults receive from the compelling charm of infant innocence, happiness and well being? Can we evaluate the instinctive response, and pleasure which is aroused in all who come in contact with a healthy and happy child? How many adults have given more than they normally would due to the increased spirit and enthusiasm aroused through affectionate interest resulting from contact with children? On the other hand, is it possible to estimate the loss to a community burdened with children that are distorted or maimed, neither strong nor healthy?

Many of the partial and complete disabilities in adults could have been corrected by proper care and treatment in childhood. These physical defects are so numerous that one is apt to feel that our development and progress is so pitifully slow that it takes a big calamity, like the World War to show the existence of these conditions. Can you realize what it means when you scan the reports of the U. S. draft boards and find that nearly 50 per cent. of the men examined were found to have certain defects?

Research and study have found the causes and methods of transmission of many diseases. As our knowledge of diseases increases, the field of application of preventative medicine expands. By the proper training and teaching of all and especially of our children, many of these afflictions can be halted and even wiped out in their track within one or two generations.

The physical and mental development of man will be elevated. However, the present generation must understand, that it may not be possible to produce perfection within their days. It is their duty, however, to assist toward that goal so that the succeeding generations will eventually reach it.

The first environment that makes the deepest impression upon us is that environment where we were born and reared and especially that place which we call home. It is there where we establish the standards that influence our lives.

At this point, I will ask that you kindly bear with me a little longer so that I may bring to your attention a few additional important problems.

A good parent is one who not only feels an intelligent interest in those affairs of health, safety, etc., that affect him and his family, but who also actively participates in humane service, especially when his activity is needed and helpful.

In the decision of the Supreme Court of the United States declaring invalid the provision of the Oregon statute which would abolish private and parochial schools, the Court leaves no room for doubt as to parental responsibilities not only in matters of education but also in matters concerning the general care of the child. "The child is not the mere creature of the State. Those who nurture him and direct his destiny have the right, coupled with the high duty to recognize and prepare for him additional obligations," says the Court. It is time that this duty is more fully recognized. The parents owe the community and the state something. They owe themselves and their children even more. They who bring children into the world should look after them.

The home is paramount in the life of not only children, but everyone. It is in the home where children should be controlled and disciplined. They should also receive knowledge that will make them morally and physically fit. No governmental or social function can ever assume the entire job of parenthood and produce a commendable race.

"As the twig is bent, so the tree inclines," is an old axiom. The responsibility for the bending of the adolescent twigs in the right direction rests upon the shoulders of the parents and overseers in the home. It is their duty to straighten the twigs so that the trees will stand erect. One of the great troubles is that the exercise of parental authority is lacking. There seems to be a disposition to shirk respon-

sibility. Relaxation and indifference is the fundamental cause of more trouble than anything else. The parents depend entirely too much upon outside influences and treatment. It is they who must inculcate into themselves and their children sound principles, and knowledge along the lines I have tried to cover so hastily. They will thus have a better understanding of the elements of those subjects that will compel us to respect more the human body and share in making our environment a fit place to live in. Parental neglect of duty toward children is responsible for many of the disasters which they plunge into. In their inexperience of life, children do not realize the many dangers before them.

The greatness of a country lies not in its material things but in its inhabitants; yes, the men, the women, and especially the children in the homes. Ideas, ideals and conduct of adults and children are best taken care of in the home. This is a fact well recognized. But the every-day citizen does not seem to appreciate that this same home is and should be a health center. All the care and attention given to one in hospitals, clinics, etc., cannot be comparable to that which is received in the home under the direction of an intelligent and careful guardian.

Our knowledge of the biology of the causative agents of disease makes intelligible to us and solves the old-time riddle of heredity of disease. There are but few diseases that are actually hereditary (*i. e.*, the infective agent passed on from the parent to offspring). That which is transmitted to the child is not frequently the organisms producing disease. Certain constitutional conditions resulting in a lowered vitality may be transmitted from generation to generation. Environment in turn can greatly influence these affected biological constitutions or hereditary predispositions in individuals.

There is a disposition to lay too much stress on heredity and very little on environment as a big factor in the cause of disease.

Unfavorable influences upon subjects with hereditary constitutional weakness will result in a lessened capability of resistance of disease than would affect those not possessing these constitutional factors. In like manner, favorable surroundings, including proper habits of living and good food will change these affected systems, so that they will be constitutionally sound and vigorous. If we find that we are helpless transmitters of undesirable inherited factors, the least we can do is alter our conduct and change our environment as to improve our conditions.

Everyone knows that a weak structure may lead to disease. A well-equipped and perfect automobile will go on any kind of a road. It may have its ups and downs on a poor road, but it finally gets there. A poorly constructed auto will not do so well on a poor road—*but it will show itself even almost perfect on a good road. Environment helps.*

The statement that what heredity causes, heredity can cure, is only partly correct. This is not all. The layman should realize that we inherit more health than disease, and that which plays a big part in the development of that which we inherit is: ENVIRONMENT.

Hereditary characteristics become changed by external conditions. The latter can induce or prevent disease according to circumstances.

Another condition which is mistaken as of hereditary influence is attributed to those diseases contracted through familial contact and also those known as household diseases. Houses occupied by individuals suffering from contagious diseases may become breeding places for those diseases not only during the lifetime of the person afflicted but even for a long time after such individual has been removed. The location of the house and the general housing problems as mentioned previously are factors which may help in preserving the life of the disease-producing organism or prepare its victim by reducing his vitality. It is frequently because of contact in the same house under unfavorable conditions that many in one family may be afflicted with the same disease. It is not due to the fact that the infective agent was passed directly from the parent to the offspring.

We are told that statistical data is a stupid thing and that it can be made to prove anything the observer wants it to. Nevertheless, if you care to take the trouble to analyze mortality rates and mathematical calculations concerning public health work (for these are the ledger pages that tell the story), you cannot fail to arrive at the conclusion that changes for the better are taking place. You will find that environment was the big factor that controlled and improved conditions. Those who try to belittle the effects of environment which may be controlled and improved, will find themselves at every turn facing many undisputed facts.

I know it is easy to say and hard to obey some of the "Whys" and "Don'ts" promulgated by well-meaning health authorities. One might think that the available knowledge and experience would help considerable. But it seems that many have been doing the wrong

things for so long, that they find it difficult to change their habits. It is the present aim of science, as it always has been, to make and keep humans healthy and happy. This is a difficult task. There are all kinds of people in this world living under conditions that are very unequal. Science, with its new ideas, must keep on incessantly fighting to have the public agree and accept facts which are true and useful. It is hard to understand why individuals stick steadfastly to long-held misconceptions. They seem to feel that scientifically proven facts, being contrary to their conceptions, are wrong, strange and even revolutionary. Our pitiful failures are due to these misconceptions and unnecessary ignorance. Attempts to awaken public consciousness to scientific facts are almost like punching a rubber ball. The latter may give way at the point of contact, but it is unaffected elsewhere. Upon release of pressure, the ball assumes its normal appearance, and the depression (or should I say impression) which was made vanishes. It is only by keeping constantly at it, that the dent becomes permanent and an integral part of the object itself.

Familiarity with sanitary regulations should be a public duty. But the great trouble is that many individuals abdicate their propriety and duty to such knowledge. Other well-intentioned folks are careless and neglectful. They overlook many things and place the burden of responsibility on a few, without sharing any part of it themselves. It is true that the public should consider seriously the fact that they are trusted as participants and not thought of merely as beneficiaries in public health movements.

Regulations, suggestions and thoughts promulgated by capable scientists for the benefit of all should be seriously considered. If you desire, disregard extremists. Take the matter into your own hands and examine such rules dispassionately in accordance with the dictates of reason and common sense. Compare them with the facts. Weigh them and measure them. There is no doubt you will benefit if you proceed in this manner. You will then do right because it is right. This is better than passing laws to compel you to do them. The modern theory of legislation which attempts to remedy human ills by passing statutes prohibiting them is far from satisfactory. Even if we do have laws and statutes which provide everything for their enforcement in the protection of public health, there is still needed an active public sentiment for lawfulness, if the laws are to be effective. People of understanding and individuals who know the obligations of good citizenship are needed. An active, determined

group of such men and women can easily bring about the sentiment which will favor the fulfillment of desirable regulations.

Science and scientists are not dogmatic. Scientists have never claimed that they possess at their command a complete knowledge of the laws of hygiene. They are frank to admit that some of the practices of today may be discarded for better ones or even altogether as being valueless. But until the era of perfection shall arrive, your co-operation is needed and should be given gladly. There might be more of general rejoicing over the hope of relieved suffering that science holds forth for the world at large.

I have expressed certain views and given some information concerning environmental factors which, I hope, will affect the minds of thoughtful persons by turning them into channels of aiding corrective measures for the elimination of undesirable conditions. Valuable scientific information and health data brought to the attention of the public sooner or later brings in its wake a consideration of those fundamentals which are absolutely necessary for the health, happiness and comfort of all.

A general realization and understanding of the laws of health together with their proper enforcement will result in the production of better born bodies and better trained minds that will be able to appreciate the things that are beautiful and sane, and help humanity in its upward surge. As soon as human reason places itself at the service of human happiness, the public at large will be found to interest themselves more in all kinds of health activities. Our standards will then rise, and advances all along the line will result.

PHARMACY WEEK.*

Radio Talk.

The art of healing is as old as humanity—and whether we pin our belief in Darwin's hypothesis or in Adam and his Eden—not forgetting Eve—we all agree that man has tenanted this planet for many a long millenium.

The art of healing, then, is as old as man—as old as pain—for it is quite believable that the first man was not without the aches and pains which must ever be the portion of the mortal being.

*Broadcast through Station WIP, by Ivor Griffith.

To the cave man pain was as real as it is to us. The quilled arrow that punctured his flesh, the heavy stone that crushed his bones and smashed his sinews probably pained him as acutely as they would us. The chase of the mastodon over hill and dale brought muscle strain and heart strain to him even as the chase of the simoleon brings aches and pains to us.

Like us, also, he looked around for the precious antidote. But the simple mind of primitive man strayed upon fantastic notions. He found his antidote to pain in strange places. With his weird incantations devised to strengthen his resistance to pain he anticipated the Christian Scientist. With his doctrine of signatures—"like cures like"—he anticipated the Homœopath, and with his wealth of good and bad herb medicines he anticipated the Allopath. One might go still further and say that with his back-breaking, spine-bending instruments of battle he anticipated the Chiropractor.

"Why," asked he, "is the poppy capsule so like a human head, unless it was intended to conquer pain with sleep?" Why did the aspen leaf quiver in the breezeless air unless it was an indication of its value in curing of ague and palsy? Yellow turmeric, he said, cured yellow jaundice, and the red blood root was designed for anemia. Yet, blindly, he came upon great truths, and out of this queer bedlam of empiric practices grew the arts and sciences of human healing.

"For the kind of sagacious information which our fathers of old gathered, is the stuff out of which ultimately science is made."

So we say that the business of human healing has had, through history, a most erratic course. The priests of Egypt, the mysterious men of Arabia, the magisters of Rome, the alchemists of Middle Europe, the doctors of the Salerno school, the seer-astrologers of Greece, the barber surgeons, the incense makers of the Bible—the secret guilds of Saracenian days, the witch, the sorcerer, the charlatan—all have had their hand in building medical history.

How many of my listeners know that the stripe of red on the barber's pole means blood, and goes back to the day when Tony the Barber was also the village cut-up (or surgeon)?

How many know that the ℞ mark on the prescription is a relic of barbarian Roman days and Roman gods, and is a cryptic prayer to Jupiter?

Every doctor who unwittingly jots down the symbol ℞ upon his prescription unwittingly also is asking the blessing of that absurd

and defunct old Roman god, over the contents of his prescription. There are times, perhaps, when the blessing is needed! Indeed, much of medicine and pharmacy up to just a century or so ago, belonged in the realm of empiricism, mysticism, chicanery and asininity and there are vestiges of these barbaric notions still remaining in our practices.

In 1233, Frederick II, of Sicily, saw the necessity of separating what had been, up to that time, a medical entity. Physician and apothecary he legally divorced one from the other. He turned the physician to the business of diagnosis and treatment, medical and surgical—and the apothecary to the business of collecting choice herbs and preparing medicines. This he did, so that one might check upon the other.

Pharmacy or the art of the apothecary had existed long before this. For the Ebers papyrus, written 3000 years before Christ, recorded complicated formulas for medicines, upon which some ancient compounder had written his comments and instructions for preparing and storing.

But it was the edict of Frederick that brought the apothecary or pharmacist into the field as a distinct factor in the scheme of human healing. Since that time great changes have taken place in medicine and in pharmacy.

But for the few moments remaining at my disposal I want to direct attention to the fact that the evolution which has so certainly changed the crude surgeon barber and bleeder and doctor priest into the great system of specialists who function in the present field of medical service, has just as certainly changed the dabbler in alchemy and the mixer of drugs into another great system of experts who supply the world's need of medicines.

Just as the field of medicine is diversified—with its surgeons, specializing in every nook and corner of our anatomical landscape, and its internists, and its pathologists, and roentgenologists, proctologists and all the other ologists, so modern pharmacy also has its diversified branches. The great work of preparing medicine is served by the several sciences of botany, of analytical and synthetic chemistry—of biology, of bacteriology, and many others. For man throughout the years and particularly so now, has garnered his remedial agents from many and varied sources. Alkaloids, resins, glucosides from plants, parts of animals, pepsin from the lowly pig, insulin from land and sea animals, bugs and beetles from all parts of the globe,

minerals from the bowels of earth, synthetic medicines from coal tar, germs dead and germs alive, all these things and a thousand others, are garnered in to ease the burdens of pain from suffering humanity.

This great breadth—the vast expanse of pharmacy is so often overlooked by the uninformed. The only exponent of pharmacy in the public eye is the drug store man on the corner. Generally he is a worthy enough exponent—although the whole profession often suffers from the unworthiness of crooked druggists who sell their soul for profit, even as the quacks besmirch medicine and the shysters the profession of law.

But pharmacy goes beyond the corner drug store. It comprehends the pharmacist chemist in his laboratory, who analyzes, standardizes, or synthesizes medicinal substances—the research worker, the botanist, the large manufacturing houses, where pills are made by the million and plasters by the mile—the biological firms, whose sera and vaccines have brought world-wide fame to American products.

The territory of pharmacy is boundless, and it embraces in its vast domain every science that contributes to the preparation and standardization of medicines.

In conclusion, let me call attention to the slogan so often seen, that "Your druggist is more than a merchant."

He is—the law demands that he be so. He must be a college-trained man—he must have satisfied the State that he is a safe and dependable dispenser of medicines. Only such a man can own and operate a prescription department—where the slip of paper that bears your doctor's judgment may be honestly and correctly filled—to the end that pain may be kept from a loved one or that death shall be kept away.

Of course, the commercial phase of the corner drug store is often too dominant. But it seemingly cannot be avoided, and often it may be justified. With it all, however, and beyond it all, your druggist is your doctor's ally in ministering to you when sickness walks in the land. You may find him there most every hour, day or night, ready to serve your wants.

In our current scheme of living he is a neighborhood necessity—professional in instinct, and engaged in the most honorable and honored ministry of mitigating the sufferings of his fellow men. It is to bring these facts before the public that Pharmacy Week has been observed during this past week throughout the land.

ABSTRACTED AND REPRINTED ARTICLES

THE APPEAL OF SCIENCE TO THE COMMUNITY.*

By Professor Alexander Findlay.
University of Aberdeen, Scotland.

The subject on which I shall venture to speak to you this evening is one which some of you, perhaps, may deem too threadbare for further consideration. The position which science holds or ought to hold among the general interests of the community has formed the theme of many an eloquent and vigorous address, and leaders among the men of science in this and other English-speaking countries have time and again urged its claims upon an apparently or supposedly slothful and perverse generation. If I then venture once more to speak on this topic it is because there are abundant evidences that the past few years have been a time of awakening and awakened interest in science, and that it is our duty to do our utmost to guide and quicken this interest. Has not the well-known Scottish writer, Sir James Barrie, borne testimony that "the man of science appears to be the only man who has something to say just now," although he somewhat unkindly adds the opinion that he is the only man who does not know how to say it? Although a great change has, I believe, taken place in public opinion, in this as well as in my own country, regarding the work of science, there nevertheless exists the necessity of urging, with persistence but also with restraint, the great importance of cultivating what we may call the scientific habit of mind and of securing the right and proper appreciation of the value of creative scientific work. We can not, therefore, consider too carefully or too frequently how, in a spirit of service, we may best frame our appeal to the community and bring to our fellow men a knowledge and appreciation of those benefits and delights which come from a study of nature.

The ground on which the appeal of science has been most frequently and, perhaps, most noisily made has been that of the utility of science, not merely in the practical business of life and of earning one's livelihood, but also in the preservation of life itself and in

*Reprinted from *Science*.

the provision of physical comfort. "Real gain, real progress," as the late Sir William Ramsay declared, "consists in learning how better to employ energy, how better to effect its transformation," and, looking back over the history, more especially of the nineteenth and twentieth centuries, down to the present day, it is easy to mark how great have been the achievements of science in this direction. One thinks, for example, of the development of the steam engine, the gas engine, the internal combustion engine; of the development of the electric dynamo and the utilization of electrical energy; of the conversion of the energy of falling water into electrical and other forms of energy; of the development of machinery of all kinds; of the concentration of chemical energy, as in explosives, and so on. And in the domain of biological science and of preventive medicine the achievements have been no less remarkable. It is the biologist and bacteriologist who have made Central Africa, for example, safe for man's habitation, and it is no exaggeration to say that the Panama Canal was built not by the engineer but by the biologist. It is the man of science who, through his influence on industrial and agricultural development and the development of natural resources, determines what population a country can support. It is the man of science, indeed, who in the last resort decides the economic fate of nations.

It was Pasteur who claimed that "in our century science is the soul of the prosperity of nations and the living source of all progress. What really leads us forward are a few scientific discoveries and their applications." And these claims can, indeed, be substantiated by the work of Pasteur himself.

In the middle of the last century, as you all know, the silk cultivation of France, of Spain and of Italy was threatened with extinction. In 1849, a disease, called *pébrine,* attacked the silkworms of France and in the short space of twelve years, we are told, "the mulberry plantations on the slopes of the Cevennes mountains, which had for long given employment to a happy and contended people, were completely abandoned, and the once radiant faces of men became sad and melancholy because misery and poverty prevailed where before happiness and plenty had reigned." In the same space of time, also, the annual revenue derived by the state from the silk industries fell from 130,000,000 to 8,000,000 francs. From the bankruptcy with which it was faced, the silk industry was saved by the scientific labors of Pasteur. It is to Pasteur, also, that much of the present-day prosperity of the various fermentation industries is due;

it is to Pasteur that we owe our earliest knowledge of the bacterial origin of disease and the production of immunity by vaccines which led to the culminating glory of Pasteur's life, the cure of rabies or hydrophobia. It is, moreover, on the foundations of Pasteur's work that the practice of antiseptic surgery was built up, whereby the havoc and torture of festering sores and gangrenous wounds were abolished from the surgical wards of our hospitals. What a glorious life of service to humanity for a single man to achieve! How irresistible must seem this appeal of science! And the people not only of France but of other countries as well answered the appeal and erected the Institut Pasteur as a tribute to the genius of Pasteur and in recognition of the services which science through him had rendered to mankind. The appeal in this case went home because it was centered in a living person whose "science" could be generally understood and whose unselfish work touched the heart and humanity of man. In contrast with the success of that appeal stands the comparative failure of the more general appeal for the support of the science laboratories of France which was made two years ago on the occasion of the national celebration of the hundredth anniversary of Pasteur's birth. The appeal in this case was too general; it awakened small response because the people could not understand its meaning. From this we learn that even the utilitarian appeal of science will arouse a general response only in so far as it is interpreted to the community in terms which the people can individually understand.

And this has been found to be the case, also, with regard to the utility of science in its applications in industry. The different countries of the modern world, and especially the older countries, are becoming more and more industrialized, and however much we may sometimes deplore the fact we must recognize that only by this means can the ever-growing populations of these countries be supported. As the populations grow and as the conditions of life become, through competition, more and more strenuous and exacting, the necessity arises for ever-increasing efficiency in the industries and in the utilization of the natural resources of the country. It is only natural, therefore, that men of science, in a spirit of helpfulness and in the consciousness of their knowledge, should have urged the vital necessity of a wider and fuller application of scientific knowledge and scientific method, for by that means alone was it possible to enlarge the scope of the industries and to increase their efficiency. For a

long time the appeal bore little fruit in my own country, and, as I gather, not very much even in this. In this country, the enormous, the apparently almost inexhaustible natural resources of the country, the great and rapidly expanding home market and the absence of any serious competition from outside made it difficult for people to realize the wisdom if not the actual necessity for avoidance of waste and for the application of science in industry. And in England the industries on which, early last century, the country grew wealthy were such that their dependence on science was not very obvious and so, owing to a natural inertia of mind and a fairly widespread prosperity, the necessity of applying more scientific methods with a view to diminishing waste and improving production, and for the purpose, also, of establishing new industries never entered very fully into the tissues of the people's minds. We prided ourselves on being a practical people; abstract learning and knowledge were held in comparative slight esteem; the investigations of men of science made little appeal to us, for the people did not understand them; the people, indeed, had not been educated so as to be able to understand them. While it is easy to place on the manufacturers the responsibility of a general backwardness in applying the discoveries of science to industry, it must be confessed that the teachers of science were not wholly free from blame for failing to enter more fully into the difficulties of the manufacturers and for failing to keep in touch with the industrial and practical life of the country and to show more clearly and convincingly the relation between their own sometimes abstract work in pure science and the practical everyday life of the community.

If, however, the appeals of science remained largely unheeded in times of prosperity they had perforce to be responded to in the adversity of war. The highest efficiency of manufacture was necessary if the country was to succeed: men of the widest scientific sympathies and of highest eminence in creative science became the directors and controllers of industry, and the least efficient factory had to be brought to the level of the most efficient. It was the demonstration of the increased efficiency produced by scientific control that made the utilitarian appeal of science carry conviction to the manufacturers, which interpreted to the mind of the layman and of the statesman the true relation between the discoveries of pure science and their applications in industry. As a result of the lessons learned

during the war, the government of Great Britain in 1919 appropriated the sum of £1,000,000 for the encouragement of scientific and industrial research. Manufacturers were encouraged to group themselves according to their industries and to establish, with the help of Government grants, research institutes where the discoveries of science could be focussed and investigations carried out on the problems of each particular industry. Government assistance was promised for a period of five years, after which time it was hoped the research institutes would have become sufficiently firmly established and would have proved their value so that the industries themselves would assume the whole burden of their maintenance. Upwards of twenty research institutes have been thus established, and they have proved themselves of the greatest value to the industries. The Department of Scientific and Industrial Research, also, instituted or supported the investigation of problems of national importance, such as the economical utilization of coal, including the methods of low temperature carbonization for the supply of a readily burning coke and of a fuel suitable for internal combustion engines. In this direction, it may be said, great advances have been made in recent years, and it is, perhaps, not too much to hope that the present generation will yet live to see a smokeless Britain, freed from the necessity of importing its supplies of motor fuel.

The Department of Scientific and Industrial Research has also sought to encourage the continued supply of adequately trained research workers by awarding scholarships and grants for materials and apparatus to graduates of the universities and to others similarly trained.

The work of the department was, at first, admittedly only an experiment, but it is now an experiment which has succeeded. The future of the application of science in industry in Great Britain is, I believe, full of hope; and although as a result of industrial depression and for other reasons the wave of enthusiasm for the application of science in industry may recede somewhat from the high-water mark of appreciation exhibited at the close of the Great War, there can be no ebbing of the tide to the level of pre-war years.

In the United States, as I am aware, even greater appreciation of the importance of science and of its applications for the material welfare of the people and for the industrial prosperity of the country has been shown by the Federal Government, by the States and by

individual firms; and one can not fail to be profoundly impressed by the very large pecuniary resources now placed at the disposal of the scientific laboratories of the universities, both by the States and by private munificence, nor can one withhold admiration of the great and ever-swelling stream of new knowledge flowing from these laboratories.

While, however, we may rejoice that the importance of science in its applications to manufacturing processes and to the general activities of our workaday life has been so largely recognized, let us always bear in mind that the gospel of efficiency, while it may bring salvation to our industries, will, if carried into action without regard to higher considerations, be productive of great evil to the people and the country. For remember, efficiency calls for organization, and organization demands discipline; but as Sir Arthur Schuster so admirably put in some years ago: "Discipline is not inborn but is acquired by education and training. In an emergency it is essential to success, but if it be made the guiding principle of a nation's activity, it carries dangers with it which are greater than the benefits conferred." The loss of individual freedom, the suppression of the sense of individual responsibility, the destruction of the human values and the conversion of man into a machine are too great a price to pay for industrial efficiency. From this evil root there can too easily spring the ruthless materialism and lust of power of which recent history has given us an example. No, let us beware of making a god of scientific efficiency; it is enough, as also it is necessary, that we make it one of the articles of our creed.

While the utilitarian appeal of science is at once the easiest to make and at present, perhaps, the most powerful to attract the interest of the community, it will, if pressed too strongly or too exclusively, result not in the development but in the decay of science and will weaken that pursuit of truth and knowledge on which the applications of science depend.

One often hears people at the present day speak as if pure science and applied science were two quite distinct and independent activities; and the so-called practical man, the man of business not specially trained in science and without the scientific habit of mind, is inclined to despise pure science and to insist that what is wanted is applied science. Now, we know, of course, that there are not two sciences but only one science—there is science pure and unqualified,

aspiring only to truth and knowledge, and there are the applications of science. There can be no application of science, no application of knowledge unless that science. that knowledge, previously exist. It is necessary to realize, it is necessary that the community shall realize that all the great revolutionary changes in our industrial life, all the great inventions which have so powerfully altered the character of our civilization have come not as the result of effort to achieve results of immediately utilitarian value, but as the result of a patient and persevering pursuit of knowledge without thought of practical or industrial applications. "These grand innovations," said Cuvier, "are only the facile applications of verities of a superior order, not sought with a practical intent, verities which their authors have pursued for their own sake, impelled solely by an ardor for knowledge. Those who put them in practice could not have discovered them; those who have discovered them had neither the time nor the inclination to pursue them to a practical result." The invention of the electric dynamo, for example, was rendered possible only by the previous discovery of electromagnetic induction by Faraday; the coal tar dye industry arose not out of an attempt to find some use for the evil-smelling liquid and still less as the result of a conscious effort to prepare from it a dye. The production of mauve did not come on the demand of the dyers (for who could have conceived the possibility of such a thing), but was the outcome of the purely scientific investigations of Perkin on the constitution of quinine. The X-ray tube also was not the result of a consciously directed effort to discover a means whereby we might, as it were, see through a brick wall, might examine the internal structure of the living body or of the inanimate crystal, but as the result of an investigation into the nature of the electric discharge in gases. And, lastly, the invention of the thermionic valve, which has rendered possible the transmission of the spoken word over the length and breadth of the earth, was rendered possible only by the study of the emission of electrons by hot bodies, carried out by men searching only for truth and knowledge. As Professor Whitehead has said: "Necessity is *not* the mother of invention; knowledge and experiment are its parents." "It is no paradox to say that in our most theoretical moods we may be nearest to our most practical applications." The applications of science to the utilities of our daily life may be the result of many years of laborious searching after knowledge, and although it is now widely, but not sufficiently widely rec-

ognized that the rule of thumb is dead and that the rule of science has taken its place, advance can continue to be made, even in the utilitarian domain, only if the people have acquired a faith in the power of science and have become convinced that the acquisition of knowledge, sought for its own sake alone, is the necessary precedent of all great inventions and applications of science.

Powerful as the utilitarian appeal of science undoubtedly is, it does not, I believe, and in the highest interests of mankind and of our western civilization I hope never will make the strongest appeal to the minds of thinking men or to men whose mental horizon lies beyond that of a purely materialistic existence. The numerous inventions which enter so largely into our modern life, the mechanical appliances and material benefits which have come from the applications more especially of physical and chemical science affect chiefly the machinery of life and are not the prime movers of men's actions; and over-emphasis of its utilitarian value may and I believe does do harm to the highest interests of science. It is, indeed, all too easy for the cynic to point to science not as the uplifter but as the destroyer of the finer qualities of mankind and to represent the aim of science as purely materialistic. The great danger, I would suggest, which we have to face in all our appeals to the community is that while proclaiming the great achievements of science in the creation of pecuniary gain and material prosperity, we lose sight of the idealism of science and destroy the true sense of values by raising the lower above the higher, the material above the spiritual. The real claim of science to fuller appreciation by the community, the claim which we should seek to urge in all our publicity activity and propaganda, yes, and in all our schemes of education in school or university is the cultural, the spiritual and the moral importance of science. It is for the idealistic aim and not only for the materialistic purpose of science that we must endeavor to win appreciation. For the community as a whole it is not the acquisition of a knowledge of the facts but the becoming imbued with the spirit of science that is of chief importance.

What, then, is the scientific spirit which we desire that all men should cultivate, and on what grounds can we urge its cultivation? The first great aim of science is the seeking out of truth, the penetration into that unknown land which always we see lying half-veiled in mist beyond the continuously receding boundaries of the unknown.

It is the beckoning finger of the spirit of truth and knowledge that lures the man of science forward. "It is the truth alone," said Scheele, "that we desire to know, and what joy there is in searching it out." It is, then, this desire for truth, the constant urge after truth, as the great German writer, Lessing, put it, that we must hold up as an aspiration to the community.

There are some who have been repelled by science and the scientific method of acquiring knowledge by the belief that science can explain nothing and that all it can do is to accumulate and record facts, the cold facts of science, as one has called them. But this is far from the truth. The recording of facts is one of the tasks of science, one of the steps towards truth, but it is not the whole of science. As Oliver Wendell Holmes said:

> "There are one-story intellects, two-story intellects, three-story intellects with skylights. All fact collectors, who have no aim beyond their facts, are one-story men. Two-story men compare, reason, generalize, using the labors of the fact collectors as well as their own. Three-story men idealize, imagine, predict; their best illumination comes from above, through the skylight."

In these sentences we have summed up for us the steps of advance towards truth by the scientific method, towards the formation of those beliefs according to which, in the physical universe, we act. The universe is not a mere mass of unco-ordinated facts and phenomena, but is like a noble edifice, the order and arrangement of whose stones are dominated by one grand idea, born in the mind of the architect. It is the work of the man of science, from partial glimpses illuminated by the light of inspired vision, to discover the divine idea by which the whole universe is ordered. Science, then, takes on a nobler and a higher purpose. As the poet, Alfred Noyes, has written:

> . . . What is all science, then,
> But pure religion, seeking everywhere
> The true commandments, and through many forms
> The eternal power that binds all worlds in one?
> It is man's age-long struggle to draw near
> His Maker, learn His thoughts, discern His law—
> A boundless task, in whose infinitude,
> As in the unfolding light and law of love,
> Abides our hope, and our eternal joy.

To the misconception regarding the work of science to which I have alluded is doubtless due the discrimination made by Sir Henry Newbolt between science and poetry—"Science is prose, poetry is imagination." Well, the facts and applications of science are no doubt prose, frequently very romantic prose; they are the results of observation and of reason by which man rises superior to the beasts and which mark the upward steps of civilization. But they are not the soul and spirit of science. The spirit of science is to be found in the great hypotheses and theories of science which, like poetry, are not the product of reason but of imagination and of inspiration which are superior to reason. For the great hypotheses of science are but attempts to gather within the bounds of a brilliant instant of inspired vision a multitude of experiences and to show the harmony of their parts. As Alfred Noyes again has said, "the great moments of science have an intense human interest and belong essentially to the creative imagination of poetry." In the great work of scientific exploration, in the work

> Of those who searching inward, saw the rocks
> Dissolving into the new abyss, and saw
> Those planetary systems far within,
> Atoms, electrons, whirling on their way
> To build and to unbuild our solid world,

and in the attempts to interpret the order and harmony of the universe, the man of science becomes the poet. Without imagination, the great discoveries of science could not be made. As the late Sir Benjamin Brodie, president of the Royal Society, said:

> "Physical investigation more than anything besides helps to teach us the actual value and right use of the imagination—of that wondrous faculty which, left to ramble uncontrolled, leads us astray into a wilderness of perplexities and errors, a land of mists and shadows; but which, properly controlled by experience and reflection, becomes the noblest attribute of man; the source of poetic genius, the instrument of discovery in science."

The cultivation of the spirit of science appeals not only to the intellect, but creates also an emotional and esthetic pleasure and so ministers to that other side of the mental and spiritual life, the desire for beauty. The aim of science is the pursuit of truth and from the roots of truth springs beauty; and whether the truth be sought

in the movements of the heavenly bodies, in the architecture of the molecules or in the grandeur of the sub-atomic universe, everywhere we find beauty. "Were nature not beautiful," wrote the mathematician Henri Poincaré, "she would not be worth knowing, life would not be worth living. I do not mean here, of course, that beauty which impresses the senses, the beauty of qualities and appearances; not that I despise it—far from it—; but that has nought to do with science; I mean that subtler beauty of the harmonious order of the parts which pure intellect appreciates." There are some indeed who moan that the joy and beauty of life have departed and that poetry has been buried under the facts of science. "The gods are dead," moaned W. E. Henley, the English poet:

> The world, a world of prose,
> Full-crammed with facts, in science swathed and sheeted,
> Nods in a stertorous after-dinner doze!
> Plangent and sad, in every wind that blows
> Who will may hear the sorry words repeated:
> "The gods are dead."

To this we must reply: the phenomena of nature do not lose in beauty as we gain an understanding of them; they become not less but more wonderful, the more fully we learn their meaning. Science does not destroy the beauty of nature, it interprets it; and the gods of joy, of beauty, of wonder and of poetry come back to life as we gaze on the mystery and beauty of the universe which science unfolds to our eyes, and as we see, in imagination, the possibilities of a fuller and nobler life through the widely and more widely opening doors of truth and knowledge.

Some there are who, impressed by the mighty achievements of science in the past and confident that still greater boons would be showered on mankind by the greater diffusion of scientific knowledge throughout the body politic, become impatient when they see, as Dr. A. D. Little has recently put it, "in the ranks of science knowledge without power and in politics power without knowledge"; and they demand for men of science a special position of power in the government of the country. Is this demand really justified? Is the claim made on behalf of the man of science not somewhat too arrogant? In connection with some of the practical activities of a government, in the planning and execution of schemes of a technical character, schemes for the conservation and economic utilization of natu-

ral resources, in the practical work of national defense, in the control of the purity of food, etc., the claims of the man of science are indisputable and have been largely recognized. But can we claim for men of science a special place in the general work of government, in the multifarious tasks of adjusting the conflicting claims, prejudices, aspirations of men not only amongst their own people but as between the different races of mankind? The man of science may, in Dr. Little's words, have "moved the earth from the center of the universe to its proper place within the Cosmos"; may have "extended the horizon of the mind until its sweep includes the 30,000 suns within the wisp of smoke in the constellation Hercules and the electrons in their orbits within the atom," but as a legislator these achievements will avail him little. It is not the 30,000 suns in the constellation Hercules but the 100,000,000 people of his own country that will claim his attention. It is not the motions of the electrons that he should understand, but the motives which influence human conduct; he should have expert knowledge not of atomic nature but of human nature, and human nature is not amenable to the laws of science. The more eminent a man is in the domain of creative science, the less successful is he likely to be in the field of politics; and to remove him from his laboratory to the legislative chamber would be to waste his special gifts and ability. One may expect to find agreement among men of science regarding the laws of science, but there is no reason to expect any unanimity among them in the domain of civil legislation. We do not strengthen but rather weaken the cause of science by making claims which neither experience nor reason can substantiate.

But while we ought not to claim for the man of science, as such, a special place in the machinery of government, we shall do well to encourage him to take a fuller share, perhaps, than he has hitherto done in the common duties of citizenship; to place more fully and unreservedly, at the disposal of his fellow men, that contribution of special knowledge and outlook which his training and studies enable him to make; to endeavor, without ostentation or arrogance, through social intercourse with men of different interests from his own, to form a more enlightened public opinion, and thereby to help in the solution of the educational, social, economic and other problems which face the community and country to which more especially he owes allegiance.

To cure or even to ameliorate the evils which flow from the weaknesses to which all democratic government is subject, we must rather work for a greater knowledge and honesty of purpose, a higher cultural level, in the community as a whole; and although we must certainly beware of claiming that the diffusion of scientific knowledge and of the spirit of science is alone sufficient, we may safely claim that it would be an important factor in the moral and social development of the people. "The cultivation of science in its highest expression," to quote the words of Pasteur, "the cultivation of science in its highest expression is perhaps even more necessary to the moral condition than to the material prosperity of a nation." It is because science inculcates "veracity of thought and action" without which, as Huxley said, "there can be no alleviation to the sufferings of mankind," that we must work for its more widespread diffusion throughout all classes of the community. It is, moreover, largely because of its moral and spiritual value, as I have said, that we must claim the inclusion of science in our general educational curricula, whether of the schools or of the universities. A knowledge of the facts of science and of the physical universe in which we live is good and necessary, but if we fail to communicate to the student the spirit of science, the passion for truth, the spirit of co-operation, of tolerance, of charity and of unselfishness which are the spirit of true scientific endeavor, we shall have failed in our most important work.

In conclusion let me say that while we must urge the claims of science on the grounds both of its practical and spiritual value, we should do so with restraint and moderation, for, in pursuing truth according to the methods of scientfic investigation, we must bear in mind that the truth to which we attain is only a partial truth. Let us always remind ourselves of the all-roundness of truth and let us remember that in our scientific approach we see but one side, one aspect of truth. Let us always recognize that through religion, art, literature and philosophy we have other paths of approach and see other aspects of the truth. Let us then carry with us the thought of the English poet, Sir William Watson, as expressed in his epigram, "The guests of heaven":

Science and Art, compeers in glory,
Boast each a haunt divine,
"My place is in God's laboratory,"
"And in His garden mine."

MEDICAL AND PHARMACEUTICAL NOTES

Marking Ink For Chemical Porcelain.—Because of the need for a marking ink for chemical porcelain ware, which has been felt by many chemists, we are glad to publish the following formula furnished by the Coors Porcelain Company, of Golden, Colorado:

18.8 gm. cobalt oxide, black commercial
1.2 gm. bismuth subnitrate

Grind together thoroughly with

15 cc. turpentine
15 drops Dresden thick oil.

—(*Jour. Ind. & Eng. Chem.*)

"Apothecary to Her Majesty, Queen Elizabeth."—The Queen gave her physician 100 pounds per annum and diet, wine, wax, etc., as perquisites, and her apothecary's bill, of which some of the items were: A confection made like a manus Christi with bezoar stone and unicorn's horn—eleven shillings. Rose water for the King of Navarre's ambassador—twelve pence. A conserve of barberries with preserved damascene plums, and other things for Mr. Ralegh—six shillings.

Pearl mixtures were very popular among the more wealthy patients; we may presume that Bulleyn's recipe for Electuarium de Gemmis would be extra to his yearly stipend! Here is the recipe:

Electuarium de Gemmis—Take two drachms of white perles; two little peeces of saphyre; jacinth, corneline, emerauldes, grannettes, of each an ounce; setwal, the sweate roote doronike, the rind of pomecitron, mace, basel seede, of each two drachms; of redde corral, amber, shaving of ivory, of each two drachms; rootes both of white and red behen, ginger, long peper, spicknard, folium indicum, saffron, cardamom, of each one drachm; of troch, diarodon, lignum aloes, of each half a small handfull; cinnamon, galinga, zurabeth, which is a kind of setwal, of each one drachm and a half; thin peeces of gold and sylver, of each half a scruple; of musk, half a drachm. Make your electuary with honey emblici, which is the fourth kind of mirobalans with roses, strained in equall partes, as much as will suffice. This healeth cold diseases of ye braine, harte and stomack.—*Medical Journal and Record.*

Rhine Gold.—As is known, Professor Haber, with his collaborators, has for some time been occupied with investigations of the noble metal content of sea water. The usual statements, reporting milligrams or even centigrams in a ton of sea water, are far too high according to his experiments. He has now extended his investigations to the water of the Rhine, filling flasks from a boat at Leverkusen and from a bridge at Karlsruhe and testing the samples for their gold content by new and sensitive methods. In both cases a mean content of approximately .003 mg. gold and about double this amount of silver per cu. m. have been found. Accordingly, from the technical standpoint, the gold content of the water of the Rhine offers no enticement. However, if a flow of 2000 cu. m. per second is taken into account, it is found that annually some 200 kg. of gold float down the river. These investigations are of significance on account of their geological implications; while likewise, in an analytical respect, they merit the greatest consideration.

Tobacco and Gastric Ills.—Tobacco may cause nervous disturbances in the stomach and even play a part in the formation of ulcers and cancers, in the opinion of Dr. Lickint, of Berlin, who has done extensive research on the effect of tobacco on the various digestive processes. He has definitely shown that nicotine slows up the digestive action of pepsin and rennet, stomach secretions. Potassium sulphocyanate, a substance that hinders the digestion of proteins, was found by him in the saliva of smokers.

Nutmeg in the Treatment of Pyorrhea.—From experiments made by Dr. Joseph Leidy (*Dental Cosmos,* April, 1925), it would appear that grated nutmeg containing the volatile oil is an excellent remedy for pyorrhea. The patient is directed to chew thirty grains thoroughly and swallow without water, with the result that the gums are improved in appearance, the discharge is lessened, the teeth are tightened, and scrapings show freedom from ameba. The average adult dose is stated to be thirty grains, which should be taken after meals and before retiring, the remedy being allowed to remain in contact with the gums during the sleeping hours to insure both local and constitutional treatment. The remedy should be given for two to three weeks.

NEWS ITEMS AND PERSONAL NOTES

OBITUARY.

John Coleman, aged sixty years, a retired druggist, died on September 12 at his home in Wheeling, W. Va., after a short illness. He was a native of Wheeling and a son of the late George Coleman. All of his business life was spent in pharmacy. He was a graduate of the Philadelphia College of Pharmacy, by which institution he was later honored with the degree of Master in Pharmacy (*Honoris Causa*). Two years after graduation he opened his first store, which grew into the chain of stores operated by the John Coleman Drug Company and the Coleman Laboratories. When he retired in 1920 he sold his chain of stores to the Hoge-Davis Drug Company, and his son, George Coleman, assumed direction of the laboratories. He was vice-president of the Central Union Trust Company, of Wheeling, and a director in various corporations and a member of several fraternal organizations. His widow, two sons, George and Leo Coleman, and three daughters, survive him.

Pharmacy Week in Philadelphia.—The first National Pharmacy Week has now passed into pharmaceutical history. It is, however, not forgotten. The public has been favorably impressed by the honest effort which the pharmacist has put forth in making known the professional side of his work, and the splendid service which he is ever willing to give and capable of rendering. The pharmacists of the country feel the warm glow of satisfaction which accompanies successful achievement of any laudable undertaking. For Pharmacy Week was a great success. True, there was not one hundred per cent. co-operation on the part of the retail pharmacists, and it is doubtful if any movement on the part of any body of people is ever attended by a perfection of cooperation, but there were many thousands of stores in the United States which did observe Pharmacy Week. The project has operated so successfully that when one will consider that each year new features can be added and that more stores will participate, the great eventual success of the idea is at once apparent.

A letter addressed to the writer has just been received from Dr. F. B. Kilmer, of Johnson & Johnson, and it states: "I would give

Philadelphia credit for the best effort in a large city." And so the pharmacists of Philadelphia who were first in American pharmacy more than a century ago could well feel proud of their emulous descendants of today, who have carried on the splendid efforts of their forefathers and were first in Pharmacy Week.

A brief outline of the local Pharmacy Week program, which was successfully carried out, follows:

PHILADELPHIA BROADCASTING SCHEDULE.

Admiral William C. Braisted, from Station WIP—Gimbel Brothers, Monday, Oct. 12th, at 6.05 P. M.

Dean Charles H. LaWall, from Station WCAU—Universal Broadcasting Station at The Pennsylvania Hotel. Tuesday, October 13th, at 7.20 P. M.

Dean J. W. Sturmer, from Station WLIT—Lit Brothers. Thursday, October 15th, at 7.50 P. M.

Professor Ivor Griffith, from Station WFI—Strawbridge & Clothier. Saturday, October 17th, at 8.30 P. M.

ADDRESSES DELIVERED BEFORE CLUBS.

Kiwanis Club of Philadelphia—Bellevue-Stratford Hotel, Tuesday noon. Dean Charles H. LaWall, speaker.

Optimists' Club—Ritz-Carlton Hotel, Tuesday noon. Dean J. W. Sturmer, speaker.

Beta Phi Sigma Fraternity—Beta Phi Sigma House, Thirty-seventh and Chestnut Streets, Wednesday night. Dr. Robert J. Ruth, speaker.

West Philadelphia Lions Club—Hotel Pennsylvania, Thursday noon. Ambrose Hunsberger, Ph. M., speaker.

Lions Club of Gloucester, N. J.—Thursday night. Professor E. Fullerton Cook, speaker.

Engineers' Club, 1317 Spruce Street—Friday noon. Dean Charles H. La Wall, speaker.

Exchange Club of Philadelphia—Bellevue-Stratford Hotel, Friday noon. Professor E. Fullerton Cook, speaker.

Philadelphia Lodge of Elks, Tuesday night. Professor Ivor Griffith, speaker.

The City Club of Philadelphia, 313 South Broad Street—Friday night. Dean Charles H. LaWall, speaker.

ARTICLES WRITTEN FOR NEWSPAPERS.

Public Ledger.—Dean J. W. Sturmer.
Evening Ledger—Dean Charles H. LaWall.
Evening Bulletin.—Professor E. Fullerton Cook.
Philadelphia Inquirer—Professor Ivor Griffith.

(In addition to the above prepared articles, various other items appeared in the press during the week covering meetings and the addresses delivered before clubs.)

PHARMACY WEEK EXHIBIT FROM THE BOTANICAL GARDENS OF THE PHILADELPHIA COLLEGE OF PHARMACY AND SCIENCE.—Through the courtesy of Frank J. Pedrick & Son, Atlantic City realtors, a large handsome window was procured on Chestnut Street, side of the Garrick Theatre, and directly opposite the Arcade. A very interesting and instructive exhibit from the College botanical gardens was installed. There, about twenty-five specimens of medicinal trees, plants, etc., were shown, including a fig tree bearing fruit, an orange tree, digitalis plants in bloom, iris, cotton, oleander, coriander, dill pomegranate, aconite, cannabis, chamomile, American wormseed, flax, thyme, lavender, dishrag gourd, and others.

This window was viewed with interest by thousands of people during the week. Large signs explained the purpose of the exhibit, one of them reading exactly the same as the caption which heads this paragraph. A card placed before each specimen also explained its use in medicine in addition to giving the Latin and English titles.

WINDOW DISPLAYS IN RETAIL DRUG STORES IN PHILADELPHIA.—It is difficult at this stage to give a nearly correct estimate of the number of retail pharmacists who co-operated by devoting one or more display windows to Pharmacy Week exhibits. It is safe to say, however, that there were several hundred windows which brought credit to the stores in which they appeared, and were the largest contributing factor to the gratifying success which Pharmacy Week earned. There were good window displays down in the heart of the business section of the city, but the observance was much more general in the neighborhood stores than was the case downtown. In some instances, three windows in one store were handsomely and scientifically dressed and in all instances they carried out the idea of professional service to the public in the interest of the conversation of the health of the nation. The utter lack of any attempt at commercialism on the part of the pharmacists of Philadelphia is certainly a splendid testimonial, and speaks volumes in favor of their high professional ideals.

On Saturday morning, Mr. Charles T. Pickett, Mr. J. W. Noble and R. J. Ruth, accompanied by two photographers, made a tour of the city and photographed the College botanical exhibit and also eleven of the drug store window displays in various sections of the

city. The photographers were furnished by Harry R. Hippler, Ph. G., of the class of 1896, P. C. P. and S. Mr. Hippler is a professional commercial photographer, located at 722 Chestnut Street. He is the official photographer for the Pennsylvania Railroad, and he very generously furnished this excellent service to the college without charge. His usual fee will be credited to him as a subscription to the building and endowment fund of the College.

The writer desires to express his appreciation to all who have helped to make Pharmacy Week a success, and especially to Dr. Thos S. Githens, of the H. K. Mulford Company, for his work in making the College botanical exhibit possible, and to Dr. Viehoever and his able staff at the College in the Department of Botany and Pharmacognosy, for their assistance in the same endeavor. Also to Mr. Mortimer M. Smith, for his services in helping to arrange the broadcasting schedule, and to Mr. Harry Swain, Mr. Charles T. Pickett, Mr. J. W. Noble and Mr. Ambrose Hunsberger, for their invaluable and untiring services.

ROBERT J. RUTH.

LADY PHARMACIST NEEDED IN WEST CHINA.—The Woman's Missionary Society of the Methodist Church, Toronto, Canada, is in immediate need of a qualified lady missionary pharmacist for work in its hospital in Chengtu, West China.

This position offers a really splendid opportunity for practical missionary work in connection with hospital and the development of modern pharmacy in its various professional spheres in that section of China with its population of one hundred million.

Good physical health combined with a missionary spirit of service are two of the main qualifications.

Further detailed information with regard to the work, and the general conditions surrounding the life of the missionary pharmacist will be gladly forwarded on request to: E. N. Meuser, Ph. B., 145 North Tenth Street, Philadelphia, Pennsylvania.

BOOK REVIEWS

FRIEDRICH WILHELM SERTÜRNER, der Entdecker des Morphiums. Von Dr. med. Franz Krömeke. Mit 3 Tafelabbildungen. Octavo, 93 pp. Mk. 5. Verlag Gustav Fischer, Jena, 1925.

The name of the German apotheker Sertürner should make the heart of every pharmacist who loves his profession beat faster, as it was one of their own who discovered meconic acid and morphine and, above all, through his researches on opium recognized that important group of alkaloids and opened a way for their isolation in other plants.

The excellent and timely monograph is divided into two parts:

1. Biography of Sertürner, together with his photo, the house in which he was born, and the Hofapotheke in Paderborn in which, as drug clerk, he discovered morphine, in 1803.

2. Copies of Sertürner's papers on the Discovery of Morphine, namely, from

1. *Trommsdorff's Journal der Pharmacie*
Vol. XIII (1805): Acid in Opium.
Vol. XIV (1806): Preparation of Pure Meconic Acid.
Vol. XX (1811): Opium and Its Crystalline Base.

2. Gilbert's Annalen der Physik
Vol. XXV (1817): Morphine, a New Base and Meconic Acid.
Vol. XXVII (1817): Morphine and Meconic Acid as Powerful Poisons.

The author deserves great credit for the reproduction of these original papers, as they are very hard to locate in the original. To the student of history of pharmacy, be he pharmacist or college professor, this monograph is highly welcome!

OTTO RAUBENHEIMER, PH. M.

FOOD AND HEALTH. By Inez N. McFee, author of "The Teacher, the School and the Community." Octavo. 345 pp. Cloth, $2.50. Thomas Y. Crowell Co., New York City.

An extremely straightforward treatise! Much has been written on this subject and much has been overlooked and misunderstood by

the reader. The trouble with most of the books on diet is that they are written by medical experts, who are too near the clinics and too far away from the kitchen! The author of the book before us, Mrs. McFee, on the contrary, is a popular writer on scientific subjects, who, above all, is a good housewife.

The following abstract of the chapter headings show the scope of this useful volume: Food as Fuel, The Calorie, The V's That Keep Us Alive, Minerals, Why Food is Cooked, Balanced Ration, Beverages, Vinegar, Spices and Condiments, Food Preservation.

An appendix gives tables of food values and the chemical analysis of ordinary foods. It is a highly interesting volume which might also be read with profit by pharmacists.

OTTO RAUBENHEIMER, PH. M.

ILLUSTRATIONS OF THE BRITISH FLORA. A series of 1321 wood engravings, with dissections of British plants, drawn by W. H. Fitch, F. L. S., with additions by W. G. Smith, F. L. S., and others, forming an illustrated companion to Bentham's "Handbook of the British Flora and Other Floras." Fifth edition; crown 8vo.; 33 pages; cloth, 12s. L. Reeve & Co., Ltd., London, W. C. 2.

The motherwork Bentham's-Hooker "Handbook of the British Flora," was reviewed in THE AMERICAN JOURNAL OF PHARMACY, July, 1925, pages 502 and 503. The book before us is a companion volume to the work and is composed of true illustrations, together with dissections so as to help to identify the different plants.

Several new features have been introduced in this edition of the "Illustrations" with the object of increasing its usefulness. In place of the bare list of Natural Orders given in previous editions and issues, the more extended "Arrangement of Natural Orders" with some of their distinguishing characters, and the Analytical Key, have been reproduced from the "Handbook." This is preceded by descriptions of the main divisions of classification with diagrammatic illustrations. In the body of the work the *English Names* and an indication of the color of the flower have been added under each illustration.

We wish the mother volume and the companion volume the best of success and continued life and hope that they will become better known in the United States.

OTTO RAUBENHEIMER, PH. M.

ANTIMON IN DER NEUEREN MEDIZIN. Von Dr. Hans Schmidt, Dresden. Octavo, 68 pp. G. M. 3. Verlag von Johann Ambrosius Barth, Leipzig.

The introduction of antimony into therapy is credited to that iconoclast of the old school, to Philippus, Aureolus, Theophrastus, Bombastus, Paracelsus von Hohenheim (1493-1541), commonly known as Paracelsus, peripatetic physician-pharmacist, philosopher, theosoph and, last, but not least, founder of iatro-chemistry. Dr. Victor Robinson, in his excellent book, "Pathfinders in Medicine," describes him in a few beautiful words, as follows: "A contradictory character, he blundered much; his mistakes were many fold, but he had some great ideas and this is a virtue that few possess."

The general medical use of antimony was due to the works of Basilius Valentinus, especially his "Currus Triumphalis Antimonii," published by Johann Thoelde, in 1664. Owing to the misuse of antimony, the Paris Faculty of Medicine even issued, in 1566, a document prohibiting its use, which, however, was repealed in 1666, owing to the cure of King Louis XIV, by the administration of antimonials.

All this and many more historical facts are laid down in Schmidt's excellent monograph. It is, however, to be regretted that the author neglected the etymology of the words "Stibium" and "antimonium," a defect which the referee hopes will be corrected in the next edition.

However, not only the old, but also the new, history of antimony and its preparations is given. The diligent author abstracted over 300 papers in the world's literature, from 1906 to 1921, and assorted these abstracts under twelve headings, from which I will mention the following most important uses: Trypanosis, Spirillosis, Lepra, Malaria, Ozena, Disinfection and Pharmacology. A separate part of the monograph contains abstracts on the use of antimony preparations in veterinary medicine. The abstracts are arranged in chronological order and are written so as to give a good understanding of the orig-

inal articles. An author's index of three double-column pages concludes this delightful monograph, which should be in the hands of everyone interested in the history and uses of antimony.

OTTO RAUBENHEIMER, PH. M.

ESSAYS OF A BIOLOGIST. By Julian Huxley. 12 mo.; 304 pp. Cloth, $2.50. Alfred A. Knopf, 730 Fifth Avenue, New York City.

Just 100 years ago, Dr. Thomas Henry Huxley (1825-1895), the celebrated English physiologist and biologist, was born. The author of the book before us, Julian Huxley, is a direct descendant of the celebrated scientist and his subject, biology, is the same as his forefather's. Consequently, something good, extraordinarily good, can be expected, in which we are not disappointed!

Contrary to all custom, the author placed the "meat" courses at each end of the menu. He, therefore, advises the readers, after finishing the first essay, "Progress, Biological and Other," to proceed at once to the very last, namely, "Religion and Science: Old Wine in New Bottles." This done, they will find the others all in a sense lesser variations upon the same themes.

The other five chapters deal with the following subjects: Biology and Sociology, Essay on Bird Mind, Sex Biology and Sex Psychology, Philosophical Ants, and Rationalism and the Idea of God. The essays are serious in treatment and intention, but are written in a most engaging style, which will commend the book to the general reader no less than to the professional.

OTTO RAUBENHEIMER, PH. M.

SIMPLIFIED NURSING. By Florence Dakin, R. N. Illustrated; 500 pages. J. B. Lippincott Company, Philadelphia.

According to the author the object of this book is to present the rudiments of nursing in a simple, definite form, technically correct. The methods therein explained may be easily, safely and accurately carried out by the home nurse (mother, wife or member of the family), by the practical nurse and by the trained attendant. The arrangement of the lessons is also well adapted for use in high school classes in home nursing.

An extensive experience covering more than twenty years has proved to the author the necessity for definite teaching to all those

who have the care of the sick and yet who have not taken a regular course in schools of nursing. It is to meet this need that this book has been written.

The matter is presented in the form of lessons which follow a general plan of "Definition," "Explanation" and "Instruction," with "Caution," "Safeguard" and "Note" where necessary. By the careful study of these lessons the inexperienced nurse or the attendant will be enabled to understand the OBJECT for which the procedures are intended and the PRINCIPLES through which this object is obtained. The instructions are given step by step, with full and complete notes designed to make the text clearer, or to refer to additional methods, suggestions, etc. The CAUTIONS call attention to the danger points, and the safeguards are preventive measures which eliminate many possible mistakes. Simple equipment for home use is described under SUBSTITUTES, and all difficult or technical words are pronounced and defined in the text, thus avoiding a constant reference to glossary or index. Preceding each lesson in chapters two and three, is a brief and exceedingly elementary preliminary discussion on the anatomy and physiology or the bacteriology relative to the specific lesson.

That the book fully attains its stated object is the least which ought to be said for it. It does more than this. It affords a most logical, sensible and elementary treatise on the art of nursing, which might well be dedicated to the curriculum of the "regular schools of nursing." If more attention was paid there to the serviceable training emphasized in Miss Dakin's book, and less to the new-fangled and much-mangled notions of advanced training in chemistry, bacteriology and the like, the "regular school of nursing" would turn out a much worthier and more practical product than it often does today.

The great defect in the education of the day, everywhere, is a neglect of fundamentals and too much flirting with the coquettish sciences. To the nurse who wants a cyclopedia of practical nursing information, and to the instructress of nurses who wants real assistance in teaching good nursing, the reviewer heartily commends Miss Dakin's book.

The printing and workmanship of the book needs no comment. It is from the printery of Lippincott, whose pride in the ancient arts still rates high.

IVOR GRIFFITH.

ENGLER, DIE NATUERLICHEN PFANZEN FAMILIEN, second enlarged edition. Wilhelm Engelmann, Leipzig; Vol. 21, 1925; (48 mk., about $12). With 288 text figures, one plate and 659 pages.

To illustrate the general scope and specific usefulness of this volume, tea is chosen as an example. The tea family (Theaceæ) is discussed in forty pages (small print) and eight illustrations, and the object of the tea plant and tea is discussed in considerable detail on six pages. The history, origin, general distribution, morphological and anatomical characteristics are described and illustrated. The chemical constituents are enumerated, as well as the commercial phases preparing the different types of tea.

It is pointed out, for instance, that fresh tea leaves, possessing no aroma, no preformed volatile oil, do not give a satisfactory beverage, unless fermented. The peculiar flavoring principle is said to be unknown. The statement is made that green tea is colored with Prussian Blue for export. Such "beautified" tea, however, is not permitted entry into this country, having a very effective supervision of teas imported.

Of special pharmaceutical interest is the discussion on cochineal, obtained from the louse coccus (p. 614) living on certain cactacæ, the discussion of the spice canella bark (p. 325), of the plant dye "annato," of dammar resin (p. 248) and especially of Carica papaya (p. 511) yielding the meat digesting enzym "papain."

None but favorable comments are offered concerning the information given, the wish is expressed that the size of illustrated structures, especially of seeds and fruits, might have been included, inasmuch as such data are so helpful in the examination and identification of natural products. Paper, print, binding are excellent, the book, the work of eleven co-operators, is a worthy addition to the series.

MOSSES. Vol. 11, 1925. With 376 text figures, and index to volumes 10 and 11.

In this volume, the reviser, V. F. Brotherus, completes the discussion of mosses (musci) begun in volume 10 of this series and previously commented upon by this writer. The geographical distribution and the morphological and histological characteristics are discussed in great detail. This work will greatly facilitate the satisfactory study of "known forms" from a chemical and economical standpoint and, we trust, will stimulate it.

ARNO VIEHOEVER.